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DEPARTMENT OF ENERGY
Environmental Management Los Alamos Field Office (EM-LA)
Los Alamos, New Mexico 87544

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NMED
Hazardous Waste Bureau

Mr. John E. Kieling
Bureau Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6303

Dear Mr. Kieling:

Subject: Submittal of the 2018 Monitoring Report for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project

Enclosed please find two hard copies with electronic files of the "2018 Monitoring Report for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project." This annual monitoring report assesses overall performance of the mitigation efforts installed in the Los Alamos and Pueblo watershed since 2007. The evaluation of precipitation, storm water discharge, and constituent concentrations obtained in 2018 were used to determine the effects of mitigations installed over the years. The "2017 Monitoring Report for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project" was approved with minor comments by the New Mexico Environment Department (NMED) on June 29, 2018. The 2018 report satisfies Appendix B, Milestones and Targets, Milestone 3, of the 2016 Compliance Order on Consent (Consent Order).

Pursuant to Section XXIII.C of the Consent Order, a pre-submission review meeting was held with the U.S. Department of Energy Environmental Management Los Alamos Field Office (EM-LA); Newport News Nuclear BWXT-Los Alamos, LLC (N3B); and NMED on February 6, 2019, to discuss changes in monitoring requirements for 2019.

If you have any questions, please contact Amanda White at (505) 309-1366 (amanda.white@em-la.doe.gov) or Cheryl Rodriguez at (505) 665-5330 (cheryl.rodriguez@em.doe.gov).

Sincerely,

Arturo Q. Duran
Compliance and Permitting Manager
Environmental Management
Los Alamos Field Office

Enclosures:
1. Two hard copies with electronic files – 2018 Monitoring Report for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project (EM2019-0106)

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April 2019
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2018 Monitoring Report for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project

EP2019-0106

2018 Monitoring Report for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project

April 2019

Responsible program director:

Bruce Robinson		Program Director	Water Program	4/18/2019
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Responsible N3B representative:

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Responsible DOE EM-LA representative:

Arturo Q. Duran		Compliance and Permitting Manager	Office of Quality and Regulatory Compliance	4/29/19
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EXECUTIVE SUMMARY

This ninth annual monitoring report provides a summary of analytical data, discharge measurements, geomorphic changes, and precipitation data associated with storm water samples collected from the Los Alamos/Pueblo (LA/P) watershed from June to November 2018. Monitoring objectives include collecting data to evaluate the effect of watershed mitigations installed in the LA/P watershed on stream flow and sediment and contaminant transport. Watershed mitigations evaluated include the DP Canyon grade-control structure (GCS) and associated floodplains; the Pueblo Canyon drop structure, willow planting, wetland, and GCS; the Los Alamos Canyon low-head weir and associated sediment detention basins; and the storm water detention basins and vegetative buffer below the Solid Waste Management Unit 01-001(f) drainage in Los Alamos Canyon. Pursuant to Section VII of the 2005 Compliance Order on Consent, Los Alamos National Laboratory (the Laboratory) had implemented interim measures to reduce the migration of contaminants within the LA/P watershed. These mitigations have been implemented with the overall goals of minimizing the potentially erosive nature of storm water runoff, enhancing deposition of sediment, and reducing access of contaminated sediments to storm water. Appendix B of the 2016 Compliance Order on Consent requires the submission of this annual monitoring report to the New Mexico Environment Department.

Gaging station and sampling locations within the LA/P watershed monitor the hydrology and sediment transport, including stations that bound the mitigation sites. Stage height/discharge is monitored at 5-min intervals at a series of gaging stations. Precipitation data are collected across the Laboratory by means of 5 meteorological towers and an extended network of 14 precipitation gages. Sampling for analytical suites specific to each reach of the watershed is conducted using portable automated samplers. Sampling equipment and the extended rain gage network are deactivated during the winter months (December to April) and reactivated in the spring.

Attenuation of flow and associated sediment transport are primary goals of the sediment transport mitigation activities. Decreasing flow velocity allows for increased infiltration, thus reducing peak discharge, reducing the distance the flood bore travels downstream, and reducing the distance sediment and associated contaminants entrained in the storm water travel downstream. In DP Canyon, the GCS and associated floodplains between gaging stations E038 and E039.1 facilitated a significant reduction in the suspended sediment being transported downstream. In Pueblo Canyon, the wetland, willows, drop structure, and GCS between gaging stations E059.5 and E060.1 facilitated such a reduction in peak discharge that storm water runoff at E060.1 was not large enough to sample. In Los Alamos Canyon, the low-head weir and associated sediment detention basins between gaging stations E042.1 and E050.1 facilitated such a reduction in peak discharge that storm water runoff at E050.1 was not large enough to sample. The 2018 monitoring data in the LA/P watershed indicate that, in general, the mitigations are performing as designed.

Geomorphic changes are monitored at one background area, five sediment transport mitigation sites, and two sediment detention basin areas that have been established in the LA/P watershed. The bank and thalweg surveys and repeat photographs support the conclusion of overall stability of the banks and channels in Pueblo, DP, and Los Alamos Canyons and establish the geomorphic change between 2017 and 2018 as minor, indicating that the watershed mitigations are performing as designed.

Based on the correlations between concentrations of metals, radioisotopes, and polychlorinated biphenyls (PCBs) in unfiltered storm water and suspended sediment concentration presented in the “2015 Monitoring Report for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project,” in 2016 the Laboratory removed certain constituents from storm water monitoring at Los Alamos and Pueblo watershed gaging stations E026, E030, E038, E039.1, E040, E042.1, E055, E055.5, E056, E059.5, and E059.8. Unfiltered target analyte list metals (as well as isotopic uranium, gross beta, and radium-226/228) at E050.1 and E060.1 continue to be monitored in response to the 2017 memorandum of understanding between the

U.S. Department of Energy and the Buckman Direct Diversion Board. Dissolved metals, total selenium, total mercury, and total recoverable aluminum (after filtration using a 10-µm pore size filter) continue to be monitored because these dissolved and total metals have numeric criteria applicable to achieving designated and attainable uses given in 20.6.4 New Mexico Administrative Code. Silver in unfiltered storm water in Acid and Pueblo Canyons and total PCBs and certain isotopic radionuclides in unfiltered storm water will continue to be monitored.

Continued monitoring in 2019 is expected to confirm the sediment transport mitigations in the LA/P watershed are performing as designed.

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Acronyms and Abbreviations

AAL	acute aquatic life
ASTM	American Society for Testing and Materials
BDD	Buckman Direct Diversion
BDDB	Buckman Direct Diversion Board
$CaCO_3$	calcium carbonate
CAL	chronic aquatic life
cfs	cubic feet per second
Consent Order	Compliance Order on Consent
DEM	digital elevation model
DOE	Department of Energy (U.S.)
EPA	Environmental Protection Agency (U.S.)
F	filtered
GCS	grade-control structure
GIS	geographical information system
GPS	global positioning system
HH-OO	human health–organism only
IMWP	Interim Measure Work Plan to Mitigate Contaminated Sediment Transport in Los Alamos and Pueblo Canyons
Individual Permit	National Pollutant Discharge Elimination System Permit No. NM0030759
Laboratory	Los Alamos National Laboratory
LANL	Los Alamos National Laboratory
LA/P	Los Alamos and Pueblo (watershed)
LiDAR	light detecting and ranging
LW	livestock watering
MDL	method detection limit
N3B	Newport News Nuclear BWXT-Los Alamos, LLC
NMAC	New Mexico Administrative Code

NMED	New Mexico Environment Department
NPDES	National Pollutant Discharge Elimination System
PCB	polychlorinated biphenyl
PQL	practical quantitation limit
RPD	relative percent difference
SIMWP	Supplemental Interim Measures Work Plan to Mitigate Contaminated Sediment Transport in Los Alamos and Pueblo Canyons
SSC	suspended sediment concentration
SWMU	solid waste management unit
TA	technical area
TAL	target analyte list (EPA)
TCDD[2,3,7,8]	2,3,7,8 tetrachlorodibenzo-p-dioxin
TRM	turf-reinforcement mat
UF	unfiltered
WH	wildlife habitat
WWTF	wastewater treatment facility

1.0 INTRODUCTION

Los Alamos National Laboratory (LANL or the Laboratory) is a multidisciplinary research facility owned by the U.S. Department of Energy (DOE) that is managed by Triad National Security, LLC. The Laboratory is located in north-central New Mexico approximately 60 mi northeast of Albuquerque and 20 mi northwest of Santa Fe. The Laboratory site comprises an area of approximately 36 mi^2, mostly on the Pajarito Plateau, which consists of a series of mesas separated by eastward-draining canyons. It also includes part of White Rock Canyon along the Rio Grande to the east.

This ninth annual monitoring report provides a summary of analytical data, discharge measurements, and precipitation data associated with storm water collected from the Los Alamos and Pueblo (LA/P) watershed from June to November 2018. In addition, the geomorphic changes at the sediment transport mitigation sites in the LA/P watershed are included in this report as Appendix A. This monitoring was initially stipulated by the New Mexico Environment Department (NMED) approval with direction for the "Los Alamos and Pueblo Canyons Supplemental Investigation Report," which states that "The Permittees must install surface water monitoring stations below each newly-installed weir and develop a monitoring plan to evaluate each weir's effectiveness" (NMED 2007, 098284). Subsequent proposed mitigation and monitoring efforts were identified and implemented per the approved "Interim Measure Work Plan to Mitigate Contaminated Sediment Transport in Los Alamos and Pueblo Canyons" (hereafter, the IMWP) (LANL 2008, 101714; NMED 2008, 103007) and the approved "Supplemental Interim Measures Work Plan to Mitigate Contaminated Sediment Transport in Los Alamos and Pueblo Canyons" (hereafter, the SIMWP) (LANL 2008, 105716; NMED 2009, 105014). Monitoring in 2018 was performed in accordance with the "2018 Monitoring Plan for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project" (LANL 2018, 603015).

Monitoring objectives include collecting data to evaluate the effect of watershed mitigations installed in the LA/P watershed on stream flow and sediment and on contaminant transport. The discussion of flow and analytical results for suspended sediment and constituent concentrations focuses on an evaluation of the overall performance of the watershed, with specific emphasis on the effects of the mitigations implemented per the IMWP and SIMWP. The discussion in Appendix A of geomorphic stability focuses on sediment stability and mobility in the watershed as a measure of the overall stability of the watershed and the performance of the sediment-mitigation structures.

The NMED approval with modifications for the 2013 monitoring plan for sediment transport mitigation (LANL 2013, 243432; NMED 2013, 523106) also directed the Laboratory to monitor storm water above and below the detention basins below the Solid Waste Management Unit (SWMU) 01-001(f) drainage in upper Los Alamos Canyon. Watershed mitigations evaluated in this report include the DP Canyon grade-control structure (GCS) and associated floodplains; the Pueblo Canyon drop structure, willow plantings, wetland, and GCS; the Los Alamos Canyon low-head weir and associated sediment detention basins; and the storm water detention basins and associated vegetative buffer below the SWMU 01-001(f) drainage in Los Alamos Canyon.

Work began in 2014 to rehabilitate and mitigate damage to the Pueblo Canyon wetlands, GCS, and gaging station E060.1 from the September 2013 flooding. Work accomplished in 2014 included planting willows below the wetlands; planting canary reed grass; installing piezometer transects to record water levels and willow performance; stabilizing the local banks; and undertaking Phase I post-flooding mitigation activities at gaging station E060.1, including armoring of the north bank directly downstream of the flume and stabilizing select banks. Work accomplished in 2015 included installing a drop structure at the Pueblo Canyon wetland headcut; installing gaging station E059.8 equipped with a v-notch flume; undertaking Phase II of gaging station E060.1 post-flooding mitigations, including redirecting the channel;

installing spurs for bank protection; contouring the area around the gaging station; installing erosion protection measures at the downstream side of both the existing Pueblo Canyon GCS and gaging station E060.1; and constructing an access road.

Key constituents of concern in the watershed addressed in this monitoring report include radionuclides. Corrective actions at the Laboratory are subject to the 2016 Compliance Order on Consent (Consent Order). Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is voluntarily provided to NMED in accordance with DOE policy.

1.1 Project Goals and Methods

The mitigations specified in the IMWP and SIMWP have been implemented with the overall goal of minimizing the potentially erosive nature of storm water runoff to enhance deposition of sediment and to reduce or eliminate the susceptibility of contaminated sediments to flood erosion. Figure 1.1-1 shows the locations of the mitigation and monitoring stations, including stream gaging stations, in the LA/P watershed. Mitigation/rehabilitation measures performed in 2014 and 2015 in response to the September 2013 floods are discussed in this report because these measures have become integral to the LA/P watershed monitoring. In the Pueblo Canyon watershed, the central focus of the mitigations is to maintain a physically, hydrologically, and biologically functioning wetland that can reduce peak flows and trap suspended sediment because of the presence of thick wetland vegetation. Stabilization and enhancement of the wetland were partially addressed with the installation of a GCS designed to inhibit headcutting below the terminus of the wetland and to promote the establishment of additional riparian or wetland vegetation beyond the current terminus of the wetland. Mitigations in upper portions of Pueblo Canyon above the wetland are designed primarily to reduce the flood peaks and to enhance channel/floodplain interaction before floods reach the wetland. Gaging stations are situated within the watershed to monitor the overall hydrology and sediment transport along the length of the watershed, including stations that bound the wetland.

In DP and Los Alamos Canyons, mitigations included stabilizing and partially burying the channel and adjacent floodplains in upper DP Canyon, which is a source of contaminants entrained in frequent floods that originate from a portion of the Los Alamos townsite. A GCS was installed with a height that encourages channel aggradation, thus reducing the potential for erosion of contaminated sediment deposits in adjacent banks during floods. Channel aggradation should also encourage the spreading of floodwaters, thereby reducing peak discharge because of transmission loss within the reach and thus enhancing sediment deposition. Lower flood peaks should also reduce the erosion of contaminated sediment deposits downcanyon of the DP GCS. Mitigations in Los Alamos Canyon several kilometers below the DP Canyon confluence involve removing accumulated sediment behind the Los Alamos Canyon low-head weir to increase the residence time of floodwaters and to enhance settling of suspended sediment and associated contaminants. (This was performed in April 2014 but not in 2015, 2016, 2017, or 2018 because not enough sediment had accumulated to warrant its removal.)

Additional mitigations were implemented in Los Alamos Canyon under a separate administrative requirement (LANL 2008, 104020; NMED 2009, 105858) to address polychlorinated biphenyl (PCB) contamination associated with SWMU 01-001(f). The mitigation actions at that location involved removing contaminated sediment from the hillslope and constructing detention basins and a willow-planted vegetation buffer at the bottom of the associated hillside drainage to promote the settling of PCB-contaminated sediments in runoff from the upgradient PCB-contaminated hillslope drainage. In addition, a pipeline was installed in 2015 under the National Pollutant Discharge Elimination System (NPDES) Permit NM0030759 (the Individual Permit) to divert townsite runoff around SWMU 01-001(f).

Inspections of all watershed mitigations are performed on a routine basis and after significant flow events (greater than 50 cubic feet per second [cfs] at locations with gaging stations or greater than 0.5 in. in 30 min at locations without gaging stations). These inspections are completed to ensure the watershed mitigations are functioning properly and to identify if maintenance may be required. Appendix B contains photographs and descriptions of each inspection and associated information.

2.0 MONITORING IN THE LA/P WATERSHED

2.1 Discharge and Precipitation Measurements and Sampling Activities

Discharge was measured and surface water sampling was attempted at 13 gaging stations in the LA/P watershed in 2018. Gaging stations with concrete, trapezoidal, supercritical-flow flumes are designated Los Alamos below Low Head Weir (E050.1), Pueblo below Grade Control Structure (E060.1), DP below Grade Control Structure (E039.1), and Los Alamos above Low Head Weir (E042.1). Nine other gaging stations that complete the monitoring network in the LA/P watershed are designated as Pueblo above Acid (E055), South Fork Acid Canyon (E055.5), Acid above Pueblo (E056), Los Alamos below Ice Rink (E026), Los Alamos above DP Canyon (E030), DP above TA-21 (E038), E059.5 Pueblo below LAC WWTF (E059.5), E059.8 Pueblo below Wetlands (E059.8), and DP above Los Alamos Canyon (E040). Figure 1.1-1 shows the locations of stream gaging stations and watershed mitigations within the Laboratory’s property boundary and on adjacent land owned by the County of Los Alamos.

Stage height was monitored at each LA/P gaging station at 5-min intervals in the LA/P watershed. Sutron 9210 data loggers stored each recorded stage-height measurement as it was made. Discharge was computed for each 5-min stage measurement using rating curves for each individual gaging station, except E055.5. Log check dams installed in 2017 caused the channel bed to fluctuate significantly through 2017. In March 2018, the gage station at E055.5 was relocated to a more stable location. In 2019, the stream will be resurveyed to produce a new rating curve for gage station E055.5. Shaft-encoder float sensors installed in stilling wells were used to measure water levels at E042.1, E050.1, and E060.1. Self-contained bubbler pressure sensors (Sutron Accubar) were used to measure water levels at E055, E056, E059.5, and E059.8 and to provide backup sensing at E042.1, E050.1, and E060.1. An ultrasonic probe sensor (Siemens Milltronics “The Probe”) was used to provide backup sensing at E042.1. Radar sensors were used to measure water levels at E026, E030, E038, E039.1, E040, and E055.5 and to provide backup sensing at E050.1 and E060.1.

A complete record of 5-min stage-height measurements for the monitoring period from June 1, 2018, to October 31, 2018, exists at E026, E030, E038, E039.1, E040, E042.1, E050.1, E055, E055.5, E056, E059.5, E059.8, and E060.1. Appendix C contains the 5-min gaging station stage and discharge data for the LA/P watershed.

Storm water programs at the Laboratory use precipitation data collected at the Laboratory’s meteorological towers. Figure 2.1-1 shows total precipitation for each month from 2013 to 2018 averaged over the Laboratory; annual heterogeneity and increase in precipitation occurs during the summer monsoon. In addition, a seasonal, extended rain gage network is deployed from April to November to coincide with storm water monitoring periods. Using a geographical information system (GIS), storm water monitoring stations are assigned to an individual rain gage using the method of Thiessen polygons. Rain gages, meteorological towers, Thiessen polygons, and the drainage area for each stream gaging station associated with the LA/P watershed are presented in Figure 2.1-2.

Sampling was conducted using ISCO 3700 portable automated samplers. Two ISCO samplers were installed at each of the following locations: E038, E039.1, E042.1, E050.1, E059.5, E059.8, and E060.1. At locations where two samplers were installed, one sampler was configured with a 24-bottle carousel to monitor primarily suspended sediment, and the second sampler was configured with a 12-bottle carousel to monitor inorganic and organic chemicals and radionuclides. At locations where a single sampler was installed, the sampler was configured with a 12-bottle carousel to monitor suspended sediment, inorganic and organic chemicals, and radionuclides. Sampler intake lines were set above the bottom of the channel or flume and were placed perpendicularly to the direction of flow. Trip levels (in discharge) and the dates during which the trip levels were active are presented in Table 2.1-1.

Sampling equipment at gaging stations in the LA/P watershed was shut down during the winter months and reactivated in the spring. Automated samplers and equipment at gaging stations were inspected weekly from June 1 to October 31 and at least monthly from November 1 to May 31. Gaging station equipment at E050.1 and E060.1 was inspected weekly throughout the year. Equipment found to be damaged or malfunctioning was repaired within 6 business days after the problem was discovered. Equipment at the 13 LA/P gaging stations was connected via telemetry to a base station, allowing real-time access to discharge measurements and battery state of charge. Inspectors reviewed telemetry daily to ensure gaging stations were functioning correctly, and gaging stations and samplers were inspected in the field when telemetry readings indicated discharge had occurred or equipment problems existed. Additionally, flumes at E039.1, E042.1, E050.1, and E060.1 were inspected for sedimentation after each discharge event and cleaned within 6 workdays after sedimentation was noted.

2.2 Sampling at the Detention Basins below the SWMU 01-001(f) Drainage

In 2018, samples were collected during one storm water sampling event with an automated sampler above two constructed detention basins below the SWMU 01-001(f) drainage at location CO111041. No samples were collected downgradient of the detention basins at the culvert at the terminus of the vegetative buffer below the lower basin (CO101038) because the detention basins would have to be near capacity to collect a sample but were empty throughout 2018. Sampling locations and storm water control features at the detention basins below the SWMU 01-001(f) drainage are identified in Figure 2.2-1. No physical evidence of storm water flow across the lower basin spillway was observed during post-storm inspections in 2018.

2.3 Sampling at the Gaging Stations in the LA/P Watershed

During the 2018 monitoring period (June 1 to approximately October 31), the sample-triggering discharge (5 cfs at E050.1/E060.1; 40 cfs at E038; and 10 cfs at the other gaging stations) was exceeded during 8 storm events occurring on 8 days as presented in Table 2.3-1. No precipitation events exceeding a sample-triggering discharge occurred before June 1 or after October 31. A total of 22 sampling events occurred during the monitoring period at LA/P gaging stations. A sampling event is defined as the collection of 1 or more samples from a specific gaging station during a specific runoff event. Maximum daily discharge at all gaging stations on days when the sample-triggering discharge is exceeded is presented in Table 2.3-1. Table 2.3-1 also summarizes the runoff events sampled at each gaging station. The reason storm water was not collected during each storm event is categorized and presented in Table 2.3-2. Deviations from the monitoring plan are explained more fully in section 2.5.

2.4 Samples Collected in the LA/P Watershed

Sample suites presented in the monitoring plan vary according to the monitoring location and are based on key indicator constituents, as well as requirements stipulated by NMED and per the 2017 memorandum of understanding between DOE and the Buckman Direct Diversion Board (BDDB) (DOE and BDD Board 2017, 602995) for a given portion of the watershed. Analyses were obtained from storm water collected at sampling locations, as presented in Table 2.4-1. In cases where insufficient water was collected to perform all planned analyses, analyses were prioritized in the order presented in Table 2.4-1. Up to 24 samples per event were collected for suspended sediment analysis from a single ISCO sampler containing a 24-bottle carousel at the lower gaging stations (E042.1, E050.1, E059.5, and E060.1) and upper DP Canyon gaging stations (E038 and E039.1) (Figures 1.1-1 and 2.1-2). Suspended sediment analyses at all other locations were obtained from the first and last sample in an ISCO sampler containing a 12-bottle carousel. Suspended sediment analyses were conducted using American Society for Testing and Materials (ASTM) method D3977-97, from an entire sample, and reported using the designation “Suspended Sediment Concentration” (SSC).

The U.S. Environmental Protection Agency (EPA) target analyte list (TAL) dissolved metals were analyzed in filtered samples at all locations. Total mercury, selenium, and uranium were analyzed in unfiltered samples at all locations. Other required analyses were conducted from unfiltered samples. Sample collection times were recorded for each individual sample bottle filled, which allowed more precise estimation of discharge and SSCs at the time samples were collected.

Analyses were conducted using the analytical methods presented in Table 2.4-2. Detection limits are provided for comparison purposes but are affected by sample-specific factors that are not fully known until after the sample is analyzed. Such sample-specific factors may include available sample volume, matrix interferences, and sample dilution.

Table 2.4-1 presents the prioritization matrix that was used to guide the submission of analyses during 2018. Summaries of analyses planned, samples collected, and analyses requested at each gaging station are presented in Table 2.4-3. Except at E050.1 and E060.1, where all events are monitored for all parameters, if four runoff events have been sampled at a gaging station during the monitoring year, subsequent events with discharge less than the largest discharge of the sampled storm events will not be analyzed.

Analyses planned and analyses performed differ during the year for several reasons including the following:

1. Incomplete sample volumes were collected.
    a. Minimum volumes are required to obtain specified detection limits. If the volumes were insufficient, select analyses were not performed.
    b. Lowest-priority analyses are omitted when incomplete volumes are collected.
2. Samples are collected in glass or polyethylene bottles.
    a. Organic chemical analyses are conducted on samples collected in glass bottles and if glass bottles did not fill, analyses were not performed.
    b. Boron was analyzed as an addition to the TAL metal suite, and samples were collected in polyethylene bottles. If sufficient volume was not collected in polyethylene bottles, then boron analyses were not ordered.

2.5 Deviations from Monitoring Plan

The 2018 monitoring plan calls for samples to be retrieved from the field within 1 business day of sample collection (LANL 2018, 603015). The interval between sample collection and sample retrieval is documented in Table 2.5-1. Where samples are not retrieved on the first business day after sample collection, the following priority order is used to collect samples:

- BDDB-related gaging stations E050.1 and E060.1: No discharges exceeded 5 cfs and no samples were collected;
- Gaging stations bounding watershed mitigations at E038, E039.1, E042.1, E059.5, and E059.8: Nine of ten sampling events were collected within 1 business day; and
- Other gaging stations at E026, E030, E040, E055, E055.5, E056, CO101038, and CO111041: Twelve of thirteen sampling events were collected within 1 business day.

In 2018, 23 sample sets were collected, retrieved, and analyzed from gaging stations and from the sampler at CO111041. Samples were collected 21 times within the first business day.

If the stage or discharge could not be correctly measured because of damage or silting that occurred, these instances are documented in Table 2.5-2. In 2018, a rating curve was not able to be established at E055.5 gaging station. Two samples were collected throughout the monitoring year; however, discharge could have exceeded sample-triggering thresholds at E055.5 because of the shifting channel bed, as noted in Table 2.5-2.

Battery voltage, stage height, and sensor function at each active gaging station were remotely monitored daily. An on-site inspection was performed if any malfunction or sample collection event was observed. Samplers and monitoring equipment were physically inspected initially in May and weekly between June 1, 2018, and November 2018. The dates of each physical inspection at each gaging station are documented in Table 2.5-3.

In 2018, Newport News Nuclear BWXT-Los Alamos, LLC (N3B) planned to analyze samples collected from gaging stations E050.1 and E060.1 for TAL metals in the sample-sediment fraction on a dry-weight basis. No discharge exceeded 5 cfs at E050.1 or E060.1 and no samples were collected at these gaging stations.

3.0 WATERSHED HYDROLOGY

The topography, geology, geomorphology, and meteorology of the LA/P watershed are quite complex and include mesas, canyons, and large-elevation gradients; alluvium, volcanic tuff, pumice, and basalt; ephemeral streams, evolving stream networks (both laterally and vertically), and sediment-laden stream discharge; winter snowfall that can create spring snowmelt, intense summer monsoonal rainfall, and occasional late summer to fall tropical storm activity; and severe spatial variability of rainfall. Consequently, monitoring of the LA/P watershed runoff is also complex and challenging.

3.1 Drainage Areas and Impervious Surfaces

The drainage area specific to each gaging station (i.e., not nested) was developed using the ArcHydro Data Model in ArcGIS, and these drainage areas are presented in Figure 2.1-2. Model inputs were developed using an elevation grid created from 1-ft light detecting and ranging (LiDAR) images (a digital elevation model from 2014) and manual site-specific controls based on field assessments. Each drainage area defines the area that drains to the particular gaging station from either the next upstream gaging station or the headwaters of the watershed.

The impervious surface area was derived from the Los Alamos County's roads and structures GIS layers. Roads, parking lots, and structures were considered impervious, and the total impervious area was computed for each watershed. The total impervious area was then divided by the total area of each watershed to compute the percent impervious surface area. The following assumptions were made in determining the percent impervious surface area: (1) the roads/parking lots and structures GIS layers were developed in 2009, and thus newer impervious surfaces will not be captured; (2) other impervious surfaces such as sidewalks and rock outcroppings may not have been included in the calculations. A significant factor in the frequency of discharge at each gaging station is the ratio of pervious to impervious surface area discharging to the gaging station or within the canyon drainage (Table 3.1-1).

3.2 Water and Sediment Transmission

Figure 3.2-1 is a flow diagram of the LA/P watershed showing each gaging station and the location of sediment transport mitigation sites. Figure 3.2-2 shows box-and-whisker plots of SSC for DP, Los Alamos, and Pueblo/Acid Canyons from up- to downstream over the past 6 yr of monitoring. As expected, Los Alamos Canyon had high concentrations of suspended sediment in 2013 as a result of the Las Conchas fire in 2011 and because there is less impervious area contributing to Los Alamos Canyon, thus making more sediment available for erosion. Large post-fire runoff events have tapered off since the fire and SSC magnitudes have returned to pre-fire levels. In contrast, SSC in DP and Pueblo/Acid Canyons is significantly less than in Los Alamos Canyon. Historical observations show that SSC in Los Alamos Canyon generally decreases from E026 to E050.1, particularly after flowing through the lower Los Alamos Canyon sediment detention basins and low-head weir (between E042.1 and E050.1). SSC then increases greatly after the Guaje Canyon confluence (E099), and decreases slightly at E109.9. Gaging station E109.9 was decommissioned after the September 2013 flood, and sampling has not been performed at E099 since 2014 because Guaje Canyon watershed is not impacted by the Laboratory; thus, sampling is not required as part of the LA/P monitoring efforts. In DP Canyon, SSC generally decreases from E038 to E039.1. This is most likely because of the large percentage of impervious area in the E038 watershed, causing high-velocity, high-erodibility flows that scour the channel between the townsite and E038; then the DP Canyon floodplains area and GCS decrease the flow velocity before it reaches E039.1, removing sediment. In 2018, SSC decreased from E039.1 to E040. This decrease is most likely because of the low magnitude storm events in 2018; storms sampled at E039.1 on August 2, August 15, and September 3 did not result in sampling events at E042.1. With large storm events, DP Canyon flows join Los Alamos Canyon to increase the flow velocity and SSC measured at E042.1, and the lower Los Alamos sediment detention basins and low-head weir remove sediment, reducing the SSC at E050.1. In 2018, E050.1 did not have flows of great enough magnitude to sample.

In Acid Canyon, SSC decreases slightly from E055.5 to E056, most likely because of the largely impervious area associated with E055.5 and the largely pervious area associated with E056. Acid Canyon joins Pueblo Canyon, in addition to many tributaries between this confluence and lower Pueblo Canyon at E059.5. In 2018, discharge at E059.5 did not reach a significant level to be sampled. From E059.8 to below the GCS at E060.1, SSC increases significantly; however, there was no flow large enough to sample at E060.1 in 2012, 2013, 2014, 2016, 2017, or 2018.

For runoff events exceeding sampling triggers in 2018, Figure 3.2-3 shows hydrographs for Los Alamos, DP, and Acid/Pueblo Canyons from upstream to downstream. Table 3.2-1 summarizes the flood bore transmission downstream across the major sediment transport mitigations, including travel time of flood bore from the upstream to the downstream gaging station, peak discharges of the flood bore at the gaging station, and the percent reduction in peak discharge between the stations for every sampled runoff event in 2018. The flood bore is defined as the leading edge of the storm hydrograph as it transmits downcanyon, and peak discharge is the maximum 5-min instantaneous flow rate measured during a flood. The focus was on peak discharge because it is related to stream power, and in ephemeral streams in semiarid climates, the greater the stream power, the greater the erosive force, and hence the greater the sediment transport (Bagnold 1977, 111753; Graf 1983, 111754; Lane et al. 1994, 111757). As flood bores move from up- to downstream, peak discharge can either increase by means of alluvial groundwater and/or tributary contributions or decrease because of transmission losses (infiltration).

Figure 3.2-4 shows the hydrograph and sedigraph for gaging stations E038, E039.1, and E042.1 that sampled through all or most of the duration of a runoff event plotted as time after the peak. Typically SSC decreases through the hydrograph as energy dissipates and is highly correlated with discharge. Table 3.2-2 shows the Pearson's correlation coefficients between discharge and SSC for these stations and runoff events. Concurrent times as well as various time lags are displayed. Pearson's correlation coefficients are computed as follows:

$$corr_{Q_t,TSS_t} = \frac{\sum_{t=0}^{n}(Q_t-\bar{Q})(SSC_t-\overline{SSC})}{\sqrt{\sum_{t=0}^{n}(Q_t-\bar{Q})^2\sum_{t=0}^{n}(SSC_t-\overline{SSC})^2}} \qquad \textbf{Equation 1}$$

where Q_t is the discharge at time t, SSC_t is the SSC at time t, n is the number of measurements to be correlated ($t = 1, 2, \ldots, n$), and

$$\bar{Q} = \frac{\sum_{t=0}^{n} Q_t}{n} \qquad \textbf{Equation 2}$$

$$\overline{SSC} = \frac{\sum_{t=0}^{n} SSC_t}{n} \qquad \textbf{Equation 3}$$

The peak SSC can occur after the peak discharge; thus, lags between 0 and 12 min are presented with the SSC lagging behind the discharge to align the peaks (after 12 min, the correlations were reduced for all stations and all runoff events). For example, when the Pearson's correlation coefficient between Q_t and SSC_{t+2} is computed, the SSC time series begins 2 min before the discharge time series.

For stations E038, E039.1, and E042.1 discharge is reasonably positively correlated to SSC with little to no lag. Figure 3.2-5 shows the linear relationship between sediment yield and runoff volume for the stations where SSC was measured throughout the runoff event over the past 6 yr of monitoring; Table 3.2-3 presents the 2013 through 2018 values shown in Figure 3.2-5. Although SSC and instantaneous discharge are not always highly correlated as a result of localized precipitation, sediment availability, or antecedent conditions, the linear relationship between sediment yield and runoff volume is well established (Onodera et al. 1993, 111759; Nichols 2006, 111758; Mingguo et al. 2007, 111756).

The runoff volume for each event was computed as follows:

$$V = \sum_{i=0}^{n} Q(t_i)(t_{i+1} - t_i) \quad , \qquad \textbf{Equation 4}$$

where n = the number of instantaneous discharge measurements taken throughout the runoff event,

t_i = the time at which an instantaneous discharge measurement is taken, and

$Q(t_i)$ = the discharge (ft^3/s) at time t_i (multiplied by 60 to convert from ft^3/s to ft^3/min).

The mass of sediment for each runoff event was computed by

$$M = \sum_{j=0}^{m} Q(t_j)(t_{j+1} - t_j)\, SSC(t_j) \quad , \qquad \textbf{Equation 5}$$

where m = the number of SSC samples taken throughout the storm event,

t_j = the time, j, at which an SSC sample is taken,

$Q(t_j)$ = the discharge (ft^3/s) at time t_j interpolated from the instantaneous discharge measurements taken at time t_j (multiplied by 60 to convert from ft^3/s to ft^3/min), and

$SSC(t_j)$ = SSC (mg/L) at time t_j (multiplied by 28.3×10^{-6} to convert from mg/L to kg/ft^3).

Figure 3.2-6 shows the linear relationship between sediment yield and peak discharge, which is not as robust as the relationship between sediment yield and runoff volume during the past 6 yr, shown in Figure 3.2-5.

3.3 Geomorphic Changes and Willow Plantings Health

Geomorphic changes that occurred from 2011 to 2018 at sediment transport mitigation sites in the LA/P watershed were evaluated and are discussed in Appendix A. The evaluation was performed via a comparison of bank and thalweg surveys encompassing accumulated change over each monsoon season dating back to 2011 where data were available and applicable.

In 2018, repeat surveying was conducted using real-time kinematic differentially corrected GPS (global positioning system) surveying equipment. The monsoon season of 2018, being generally average to below average in its intensity of rainfalls, has resulted in minor annual changes to morphology of monitored features and caused no significant geomorphic changes within the watershed since the survey in 2017. Analysis of repeat survey data going back to 2011 support the conclusion that features within the watershed have stabilized following the effects a large flood event in 2013 that modified much of the geomorphology in Los Alamos, DP, and Pueblo Canyons.

Coyote willows (*Salix exigua*) were planted in Pueblo Canyon to aid in surface stabilization, reduce flow velocity, and promote sediment accumulation. Many of the willows planted in the upper Pueblo Canyon willow planting area were laid down during the September 2013 flood, but have resprouted in the following years and continue to attenuate flood energy and promote local channel stability/aggradation. Baseline coyote willow qualitative monitoring in lower Pueblo Canyon was first conducted in November 2016 and has been conducted every year since. To monitor willow communities in lower Pueblo Canyon, the average range of plant growth (height and basal diameter) and spatial distribution of willow stands as well as repeat photographs are used to characterize and define discrete willow communities. Since they were planted in 2014, willow stands closer to the active channel and in typically saturated substrates have grown the most, whereas willows that were planted on sand/gravel bars where there is a lack of consistently saturated substrate have not grown as much. There have been no observed changes in the distribution or number of stands for the lower Pueblo Canyon willow communities between 2016 and 2018.

3.4 Impact and Efficiency of Watershed Mitigations

Below is a discussion of each watershed mitigation and the impact and efficiency of that system.

DP Canyon: Sampling was performed in DP Canyon on August 2, 10, 15, and September 3 above (E038) the GCS and upstream wetland; below (E038.1) the GCS and upstream wetland sampling was performed on August 2, 10, 15 and September 3 and 4 (Table 2.3-1). SSC analyses performed from samples collected during these runoff events allow direct evaluation of the effect of the GCS and upstream wetland on flow and sediment transport (Figures 3.4-1 and 3.4-2). Sample collection began within 5 min of peak discharge (triggered above 40 cfs for E038 and 10 cfs for E039.1). For E038 and E039.1, respectively, the calculated sediment yield is 1.1 yd^3 and 0.2 yd^3 on August 2; 1.8 yd^3 and

0.86 yd^3 on August 10; 1.7 yd^3 and 0.15 yd^3 on August 15; 1.7 yd^3 and 0.023 yd^3 on September 3; and 1.2 yd^3 on September 4 at E039.1 (E038 did not sample on September 4) (Table 3.2-3). Between these two stations, or from above to below the GCS/wetland, there is a 85%, 52%, 91%, and 99% relative percent difference (RPD) decrease in sediment yield for the August 2, 10, 15, and September 3 events, respectively.

Overall statistics over the past 6 yr of monitoring are also useful in assessing performance. Figure 3.4-1 shows box-and-whisker plots for E038 and E039.1 for SSC and peak discharge. These plots show major reductions in SSC and slight reduction (depending on the year) in mean peak discharge (i.e., erosive force) over the 6 yr, which is consistent with the goals of the sediment transport mitigation activities.

Decreasing storm water velocity allows for increased infiltration, thus reducing peak discharge, reducing the distance the flood bore travels downstream, and reducing the distance that sediment and associated contaminants entrained in the storm water travel downstream. Increasing infiltration reduces peak discharge but can also decrease the total volume of storm water. In 2018, the peak discharge decreased in 10 of 11 measureable runoff events between E038 and E039.1, with an average decrease of 63% RPD, and increased in 1 of 11 runoff events, with an increase of 42% RPD (Table 3.2-1).

Pueblo Canyon: In 2018, no SSC analyses were performed in Pueblo Canyon above the drop structure (E059.5), below the drop structure (E059.8), or below the wetland and GCS (E060.1) (Table 2.3-1). Therefore, overall statistics over the past 6 yr of monitoring must be used to assess performance. Figure 3.4-1 shows box-and-whisker plots for E059.5, E059.8, and E060.1 for SSC and peak discharge. As these plots indicate, mean peak discharge was effectively attenuated through the Pueblo Canyon wetland, resulting in little to no transport from the upper Pueblo watershed into lower Los Alamos Canyon. This is consistent with the goals of the sediment transport mitigation activities. In 2018, the peak discharge decreased in six of six measurable runoff events between E059.5 to E059.8 with an average decrease of 97% RPD. The peak discharge between E059.8 and E060.1 increased in one of one measurable runoff events with an increase of 100% RPD (Table 3.2-1).

The discharge magnitude is being reduced through this area, which is a primary goal of the mitigation actions. Indeed, discharge is being reduced so much that no samples were collected at E060.1 in 2012, 2013, 2016, 2017, or 2018; SSC was not analyzed for the one sample collected in 2014; and only two samples were collected in 2015. In addition, SSC magnitude was reduced through the mitigation structures in 2015.

Los Alamos Canyon: Sampling was performed in Los Alamos Canyon on September 4 above (E042.1); no sampling occurred in 2018 below (E050.1) the lower Los Alamos sediment detention basins and low-head weir (Table 2.3-1). Sample collection began within 5 min of peak discharge (triggered above 10 cfs for E042.1). For E042.1, the calculated sediment yield for the September 4 storm sampling is 1.8 yd^3 (Table 3.2-3). In 2018, peak discharge decreased in four of four measureable runoff events between E042.1 and E050.1, with an average decrease of 82% RPD (Table 3.2-1). Sediment trapping efficiency is expected to be higher in smaller events and events early in the season before the detention basins have filled with water. Flow is reduced through the weir and the upstream sediment detention basins, allowing sediment to settle out of suspension; thus, this mitigation feature is performing as designed.

In addition to examining coinciding sampling events, performance of the weir and upstream sediment detention basins can be assessed by examining overall statistics over the past 6 yr of monitoring. Figure 3.4-1 shows box-and-whisker plots for E042.1 and E050.1 for SSC and peak discharge. These plots show major reductions in SSC, particularly in the post–Las Conchas fire years of 2012 and 2013; thus, the weir is performing as designed. Minor reductions in peak discharge occurred from 2011 to 2013 and from 2016 and 2018; minor increases in peak discharge occurred in 2010, 2014, 2015, and 2017.

4.0 ANALYTICAL RESULTS

Appendix C contains the analytical results for the LA/P watershed. Appendix B of the 2016 Consent Order requires the submission of this annual monitoring report to NMED.

4.1 Analytes Exceeding Comparison Values

The watershed mitigations in the LA/P watershed have been constructed to mitigate the transport of contaminated sediments, and the analytical results from monitoring are presented and evaluated within this context. The mitigation actions were not undertaken with the objective of reducing concentrations of water-borne contaminants to specific levels, and the analytical results are therefore not compared with water-quality standards or other criteria for that purpose or for the purpose of evaluating compliance with regulatory requirements. For this report, monitoring results are compared with water-quality standards at the request of NMED.

The New Mexico Water Quality Control Commission Standards for Interstate and Intrastate Surface Waters (20.6.4 New Mexico Administrative Code [NMAC]) establish surface water criteria. Surface waters within DP Canyon at E038, Pueblo, and Acid Canyons are unclassified, non-perennial waters of the state under 20.6.4.98 NMAC, with segment-specific designated uses of livestock watering, wildlife habitat, marginal warm-water aquatic life, and primary contact. The criteria applicable to the marginal warm-water aquatic life designation include both acute and chronic aquatic life criteria and the human health–organism only (HH-OO) criteria. Surface waters within Los Alamos Canyon and DP Canyon at E039.1 are classified as ephemeral and intermittent waters of the state under 20.6.4.128 NMAC, with segment-specific designated uses of livestock watering, wildlife habitat, limited aquatic life, and secondary contact. The criteria applicable to the limited aquatic life designation include the acute aquatic life criteria and the HH-OO only criteria but do not include the chronic aquatic life criteria.

Water quality criteria for total and total recoverable pollutants are compared with unfiltered surface water sample concentrations. The water quality criterion for total recoverable aluminum is for filtered storm water samples using a 10-µm pore size; however, NMED's Surface Water Quality Bureau suggested that a 10-µm filter size is too large (NMED 2016, 602301); thus this report presents exceedances of the 0.45-µm pore size. Other water quality criteria are for dissolved concentrations of pollutants, which are compared with filtered storm water samples using a 0.45-µm pore size. Acute and chronic aquatic life criteria for dissolved cadmium, chromium, copper, lead, manganese, nickel, and zinc, and acute aquatic life criteria for dissolved silver, are calculated based on the hardness of each sample. Concurrent hardness values in the LA/P watershed range between 8.87 mg/L and 67.7 mg/L (average value is 50.9 mg/L) calcium carbonate ($CaCO_3$) calculated from calcium and magnesium values from storm water collected in 2018. Hardness-dependent metals criteria are strongly influenced by the hardness value used in the calculation, i.e., a low hardness value results in a low metals criterion and a high hardness value results in a high metals criterion. The water quality criteria for dioxins are the sum of the dioxin toxicity equivalents expressed as 2,3,7,8 tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD). Table 4.1-1 presents the comparison of detected analytical results from 2018 with the water quality criteria.

The Los Alamos County townsite routes most of its storm water and entrained pollutants into Los Alamos and Pueblo Canyons. Storm water pollutant loading to receiving waters is derived from the decay of buildings, parking lots, roads, and automobile traffic emissions that occurs in a developed urban landscape and is common to urban developed landscapes throughout the developed world (Tsihrintzis and Hamid 1997, 602314; Göbel et al. 2007, 252959). Many of the structures and impervious surfaces within the Los Alamos County townsite are older and have weathered over the years and continue to shed metals and organic compounds to Los Alamos and Pueblo Canyons adjacent to the townsite. In addition, pollutants have accumulated in sediments in canyon bottoms over time and are mobilized during storm flow events in canyon bottoms and are commonly detected throughout the gage network adjacent to and downstream of the Los Alamos townsite.

A large portion of townsite runoff is routed to DP canyon, the south fork of Acid Canyon, and upper Pueblo Canyon. Most of the exceedances observed in 2018 are metals and PCBs detected at gage stations located directly downstream from these routing pathways. In 2018, 36 hardness-dependent metals (including aluminum, copper, lead, and zinc) with chronic and acute aquatic life criteria exceedances were observed at gaging stations adjacent to and directly downstream from the Los Alamos townsite at E038, E039.1, E040, E055, E055.5, and E056.

In 2018, there were 14 aluminum exceedances of NMED's hardness-dependent acute and chronic aquatic life screening criteria in storm water ranging from 207 to 656 µg/L; the average value of all 22 detected dissolved aluminum results is 405 µg/L. Hardness-dependent water quality criteria range from 77.7 to 498 µg/L. Until December 2018, the national acute aquatic life criteria was 750 µg/L and the chronic aquatic life criteria was 87 µg/L. In December 2018, EPA updated its recommended criteria for aluminum in freshwater to reflect aluminum's bioavailability to living organisms like fish and invertebrate species. The bioavailability and associated toxicity of aluminum are calculated using a multiple linear regression model using pH, dissolved organic carbon, and total hardness.

Because hardness in storm water runoff is typically very low, the corresponding calculated aluminum water quality criteria is low, resulting in a greater number of exceedances. Aluminum in storm water is representative of the natural background composition of the Bandelier Tuff (LANL 2013, 239557). On the Pajarito Plateau, much of the sediment-bound aluminum is associated with poorly crystalline silica-rich glass of Bandelier Tuff. As the tuff weathers, the glass particles and associated aluminum form sediment that accumulates, is entrained, and is then transported by storm water runoff. In addition, aluminum is generally not an issue or problematic in runoff from developed urban landscapes on a national scale and is not associated with current or historical industrial processes within the Los Alamos County townsite.

Copper exceedances in 2018 range from 2.19 to 6.56 µg/L; the average value of all 22 detected dissolved copper is 3.50 µg/L. The corresponding acute and chronic aquatic life screening criteria range between 1.49 and 5.79 µg/L. To put this into perspective, the copper acute aquatic life criteria threshold in the NPDES Individual Permit (NM0030759) is 4.3 µg/L calculated with a hardness of 30 mg/L $CaCO_3$. Copper is a component of brake pads and roofing materials and is a common constituent in storm water emanating from urban environments in both dissolved and colloidal form (TCD Environmental 2004, 602305). With this in mind, copper exceedances are most likely due to runoff from the impervious developed landscape within the Los Alamos townsite.

Lead exceedances in 2018 range from 0.449 and 1.87 µg/L. The average value of all 16 detected dissolved lead is 0.793 µg/L. Several lead results were observed above the chronic screening criteria in 2018. The hardness-dependent aquatic life screening criteria range between 0.242 and 24.1 µg/L. Lead is a common component of house paint, building siding, and automobiles and is commonly found in storm water runoff from urban landscapes on a national scale (Davis and Burns 1999, 602303; Göbel et al. 2007, 252959), such as the Los Alamos County townsite. Because of the low solubility in the neutral pH range, lead is usually present in particulate form entrained in urban storm water.

Eighteen gross alpha radioactivity concentrations were observed above the 15 pCi/L screening level threshold in 2018. The exceedances range from a minimum of 15.3 pCi/L to a maximum radioactivity concentration of 284 pCi/L; average value of all 22 detected gross alpha results is 47.2 pCi/L. Gross alpha is strongly correlated with SSC and is associated with the decay of naturally occurring uranium and thorium in the Bandelier Tuff (LANL 2013, 239557). Although there have been discharges of legacy radionuclide pollutants in the past at select locations within the Laboratory, the alpha activity of those constituents when measured by alpha spectroscopy contributes an insignificant amount of activity to the gross alpha activity values (McNaughton et al. 2012, 254666).

One selenium result was observed above the New Mexico Wildlife Habitat screening criteria in 2018 from the sample collected at E042.1 on September 4, 2018. The selenium concentration of 7.0 µg/L was observed. Twelve of thirty-three selenium results collected at E042.1 since July 2010 have exceeded the New Mexico Wildlife Habitat screening criteria of 5.0 µg/L.

Two zinc results were observed above the hardness-dependent acute or chronic screening criteria in 2018. The concentration of zinc measured at E038 from the sample collected on August 10 was 33.2 µg/L, which was greater than the acute screening criteria of 27.6 µg/L based on the measured hardness of 14.5 mg/L in the sample. The concentration of zinc measured at E056 from the sample collected on August 9 was 24.9 µg/L, which was greater than the chronic screening criteria of 19.7 µg/L based on the measured hardness of 13.6 mg/L in the sample.

PCBs are by far the most common compound that exceeded water quality criteria in 2018. Total PCB concentrations range from 0.00731 to 3.74 µg/L and most often exceed the most sensitive screening level (HH-OO threshold of 0.00064 µg/L). The average overall exceedance concentration observed in 2018 is 0.232 µg/L and is heavily weighted by PCB concentrations observed at CO111041 (upper Los Alamos detention basins). Without the upper Los Alamos detention basin results (see section 4.5), the average PCB concentration is 0.065 µg/L, which is greater than the urban runoff PCB median value of 0.012 µg/L reported in the 2012 PCB report presenting PCB concentrations in Los Alamos County storm water runoff (LANL 2012, 219767). In addition to electrical transformer cooling fluids, PCBs were commonly used as a stabilizing agent for paints, caulking, oils, hydraulic fluid, road paint, pigments, plastics, and a host of other industrial materials. The ubiquitous distribution of PCBs in an urban setting in addition to atmospheric deposition and very low screening levels accounts for the relatively high number of detections and exceedances in surface and storm water emanating from developed urban landscapes in Los Alamos County (LANL 2012, 219767). In addition, PCBs have been archived in sediment and organic material that is occasionally released from the terrestrial inventory and transported in storm water flow events to canyon bottoms.

The method detection limits (MDLs) reported for analyses of nondetected 2,3,7,8 TCDD, cadmium, silver, and thallium exceeded the screening levels for those compounds. Cadmium MDLs were 1.07 to 0.38 times larger than the hardness-dependent acute screening levels and 3.0 to 2.3 times larger than the hardness-dependent chronic screening levels. Silver MDLs are 3.3 to 0.43 times larger than the hardness-dependent acute screening levels. The thallium MDL of 0.6 µg/L is 1.3 times the human health screening level of 0.47 µg/L. The MDL for 2,3,7,8-TCDD in the sample analyzed was 4.07 pg/L, which is 80 times the human health screening level of 0.051 pg/L. More sensitive analytical methods are not available for these compounds.

In summary, exceedances in storm water are associated with pollutant loadings emanating from Los Alamos County and are mainly associated with the developed urban landscape and day-to-day activities associated with the weathering of roads, parking lots, and structures that are in various stages of decay and with vehicle traffic. The chemical signature of storm water runoff is representative of many urban landscapes on a national scale.

4.2 Relationships between Discharge and SSC

Discharge was calculated from stage height using a rating curve, which is the relationship between discharge in cubic feet per second and height of the water in feet, developed for each individual gaging station. Stage height was measured at 5-min intervals and logged continuously during each sampled storm event. SSC and particle size were measured during each storm in conjunction with inorganic and organic chemicals and radionuclides.

SSC and instantaneous discharge estimates were calculated for each sample using a linear relationship between the two corresponding analytically determined SSCs or the two corresponding physically measured discharges, as follows:

$$y = mx + b$$ **Equation 6**

where y = the calculated SSC or discharge at the time of sample collection,

m = the slope of the line,

x = the time differential in minutes between SSC sample collection or discharge measurements, and

b = the concentration of analytically determined SSC before sample analyses or corresponding physically determined discharge.

The slope is determined by dividing the difference in SSC or discharge by the difference in time, in minutes, between SSC sample collection or discharge measurements before and after analytical sample collection. This equation was used to calculate SSC and instantaneous discharge for samples collected. Where analytical results are not bounded by sediment results, the concentration of the nearest sediment result is used as an estimate of the sediment concentration at the time the sample was collected. If SSC was not measured during a storm, an estimate was not produced. The calculated SSCs and instantaneous discharges are presented in Table 4.2-1.

4.3 Relationship between SSC and Concentrations of Constituents

The projected total metal values for each sample with measured SSC analyses were planned to be calculated using equations presented in Appendix D of the “2015 Monitoring Report for Los Alamos/ Pueblo Watershed” (LANL 2016, 601433). No samples were collected at E050.1 or E060.1 from 2015 to 2018 with sufficient sediment content to allow for this analysis. Sampling is planned for 2019 to continue the assessment of the relationship between SSC and total metals concentrations. SSC-estimated concentrations for each metal and isotopic uranium are presented in Table 4.3-1.

4.4 Storm Water Sampling below SWMU 01-001(f)

The 2018 result for the storm water sample analyzed for total PCBs collected at the inlet to the upper detention basin below the SWMU 01-001(f) drainage is 3.74 µg/L. This total PCB result is within the range of results for samples collected from 2011 to 2017. The results continue to indicate the hillslope is a source of PCBs, even after sediment and rock were removed during corrective action at SWMU 01-001(f) in 2010.

5.0 CHANGES FROM THE 2017 REPORT

Based on changes that occurred in 2018, this report has been updated from the 2017 report. The changes are summarized below:

- In 2018, there was no runoff event larger than 5 cfs at either E050.1 or E060.1, and neither of the stations collected a sample. Therefore, it was not possible to analyze total metals or to analyze TAL metals in the sample-sediment fraction on a dry-weight basis.
- Alluvial water-level monitoring data collection in the lower section of Pueblo Canyon was completed in 2017. The piezometers were removed in January of 2018. The 3 yr of water level data in addition to vegetation surveys have shown that the willows planted in 2014 have successfully established and have sufficient water to remain established. Because of the discontinued piezometer water-level monitoring, the previous Appendix B, Pueblo Canyon Wetland Piezometer Levels, is not included in this report.

6.0 CONCLUSIONS

Attenuation of flow and associated sediment transport are primary goals of the sediment transport mitigation activities. Decreasing flow velocity allows for increased infiltration, thus reducing peak discharge, reducing the distance the flood bore travels downstream, and reducing the distance sediment and associated contaminants entrained in the storm water travel downstream. In DP Canyon, the GCS and associated floodplains between gaging stations E038 and E039.1 facilitated a significant reduction in the suspended sediment being transported downstream. In Pueblo Canyon, the wetland, willows, drop structure, and GCS between gaging stations E059.5 and E060.1 facilitated such a reduction in peak discharge that storm water runoff at E060.1 was not large enough to sample. In Los Alamos Canyon, the low-head weir and associated sediment detention basins between gaging stations E042.1 and E050.1 facilitated such a reduction in peak discharge that storm water runoff at E050.1 was not large enough to sample. The 2018 monitoring data in the LA/P watershed indicate that, in general, the mitigations are performing as designed.

Geomorphic changes are monitored at one background area, five sediment transport mitigation sites, and two sediment retention basin areas that have been established in the LA/P watershed. The bank and thalweg surveys and repeat photographs support the conclusion of overall stability of the banks and channels in Pueblo, DP, and Los Alamos Canyons and establish the geomorphic change between 2017 and 2018 as minor, indicating that the watershed mitigations are performing as designed.

Based on the correlations between concentrations of metals, radioisotopes, and PCBs in unfiltered storm water and suspended sediment concentration presented in the "2015 Monitoring Report for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project," in 2016 the Laboratory discontinued monitoring certain constituents from storm water monitoring at Los Alamos and Pueblo watershed gaging stations E026, E030, E038, E039.1, E040, E042.1, E055, E055.5, E056, E059.5, and E059.8 (LANL 2016, 601433). Unfiltered TAL metals (as well as isotopic uranium, gross beta, and radium-226/228) at E050.1 and E060.1 continue to be monitored in response to the 2017 memorandum of understanding between DOE and the BDDB (DOE and BDD Board 2017, 602995). Dissolved metals, total selenium, total mercury, and total recoverable aluminum (after filtration using a 10-µm pore size filter) continue to be monitored because these dissolved and total metals have numeric criteria applicable to achieving designated and attainable uses given in 20.6.4 NMAC. Silver in unfiltered storm water in Acid and Pueblo Canyons and total PCBs and certain isotopic radionuclides in unfiltered storm water will continue to be monitored.

Continued monitoring in 2019 is expected to confirm the sediment transport mitigations in the LA/P watershed are performing as designed.

7.0 REFERENCES AND MAP DATA SOURCES

7.1 References

The following reference list includes documents cited in this report. Parenthetical information following each reference provides the author(s), publication date, and ERID, ESHID, or EMID. This information is also included in text citations. ERIDs were assigned by the Laboratory's Associate Directorate for Environmental Management (IDs through 599999); ESHIDs were assigned by the Laboratory's Associate Directorate for Environment, Safety, and Health (IDs 600000 through 699999); and EMIDs are assigned by N3B (IDs 700000 and above). IDs are used to locate documents in N3B's Records Management System and in the Master Reference Set. The NMED Hazardous Waste Bureau and N3B maintain copies of the Master Reference Set. The set ensures that NMED has the references to review documents. The set is updated when new references are cited in documents.

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7.2 Map Data Sources

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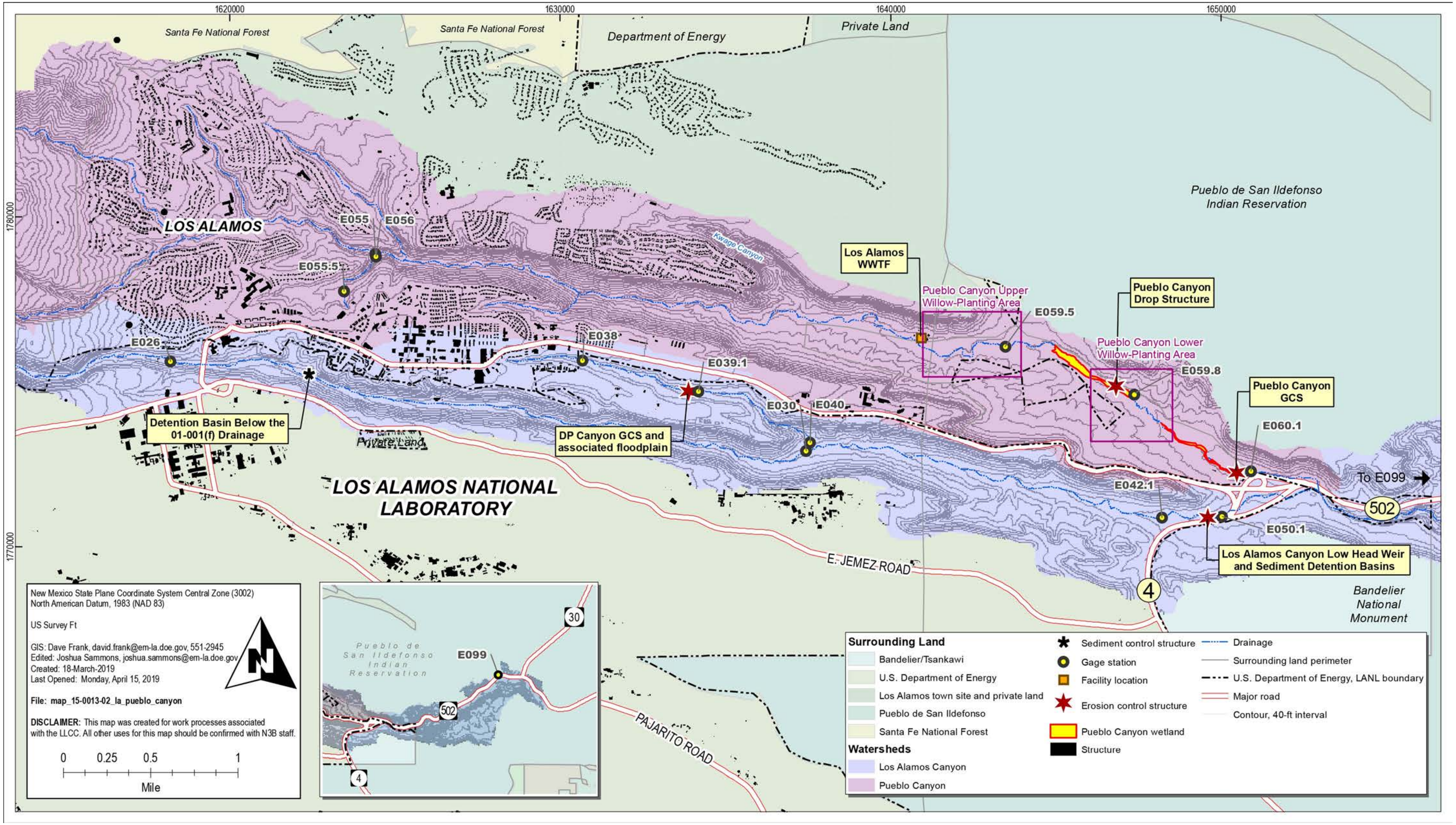


Figure 1.1-1 Los Alamos and Pueblo Canyons showing monitoring locations and sediment transport mitigation sites

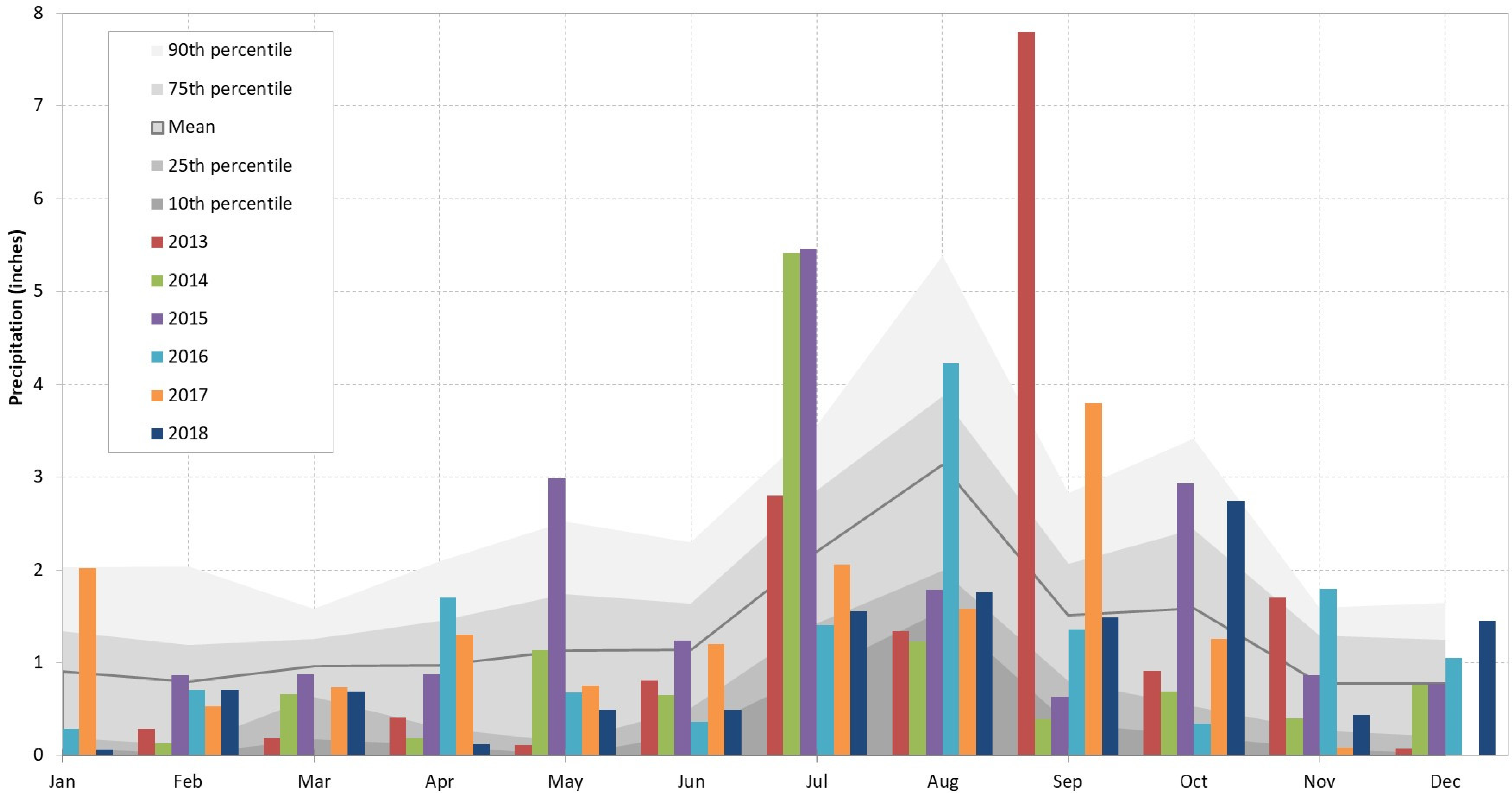


Figure 2.1-1 Total precipitation for each month between 2013 and 2018 based on meteorological tower data averaged across the Laboratory (mean and percentiles are based on data from 1992 to 2010)

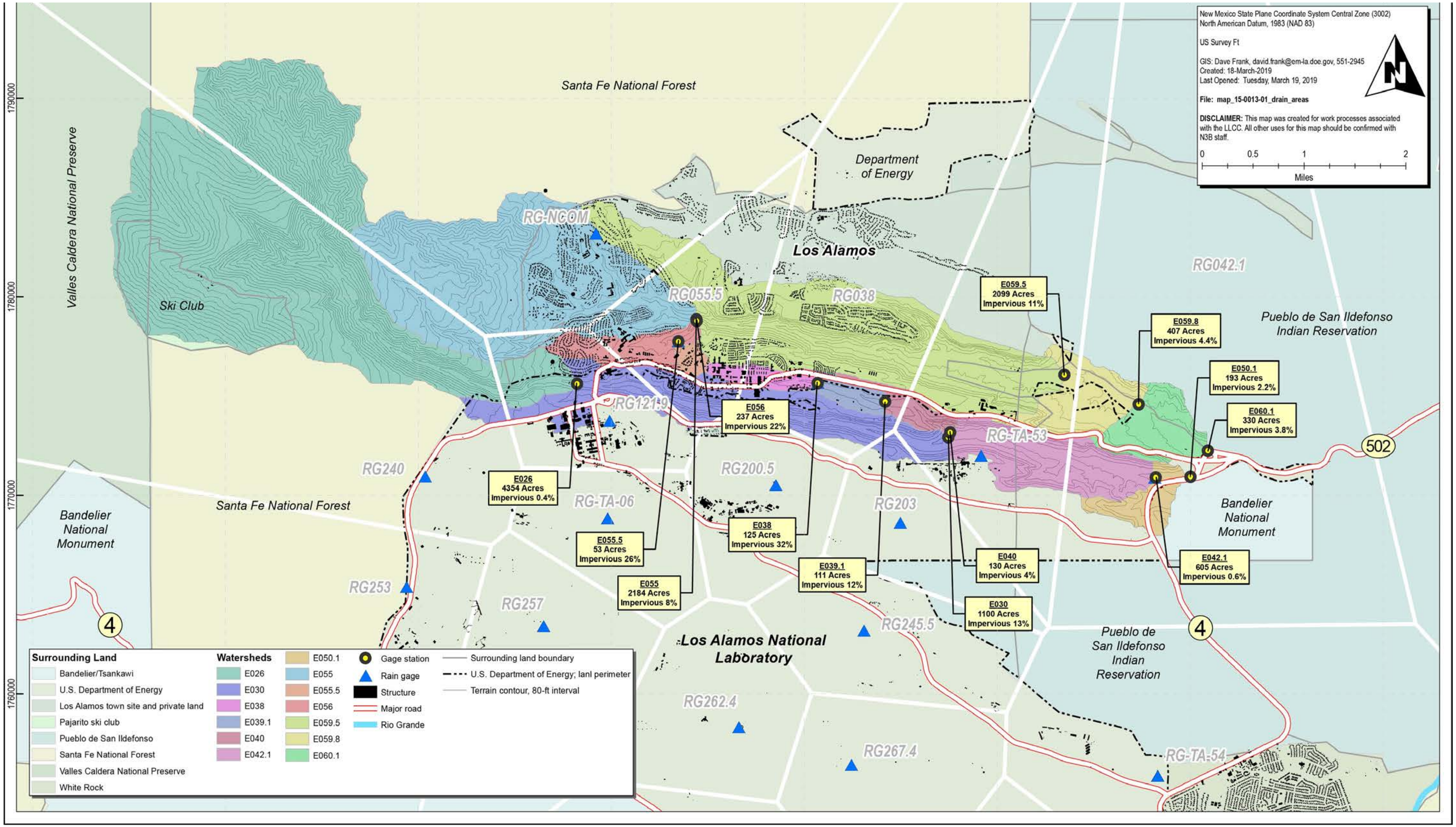


Figure 2.1-2 LA/P watershed showing drainage areas for each stream gaging station and associated rain gages and Thiessen polygons

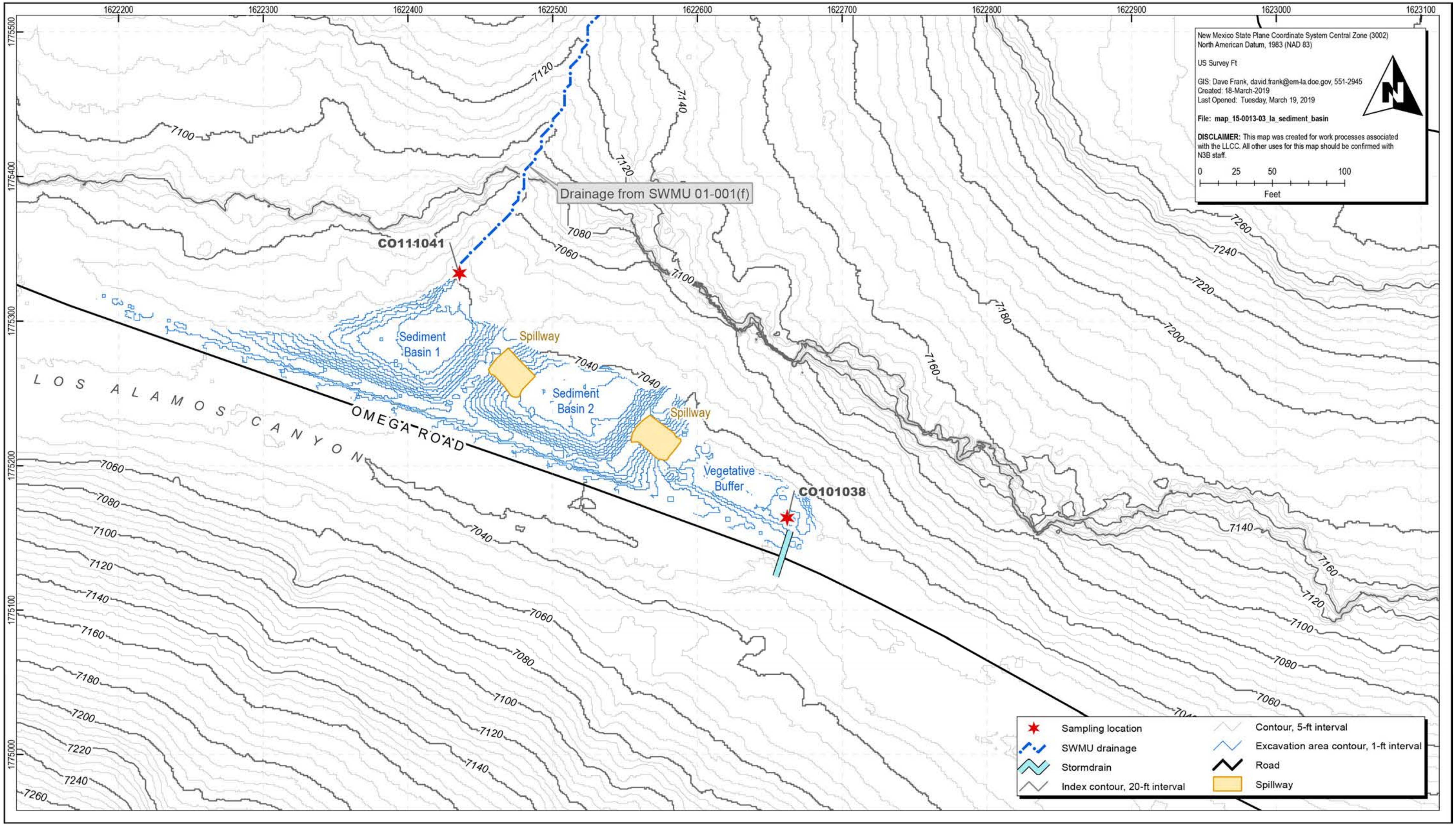


Figure 2.2-1 Upper Los Alamos Canyon sediment detention basins and sampling locations below the SWMU 01-001(f) drainage

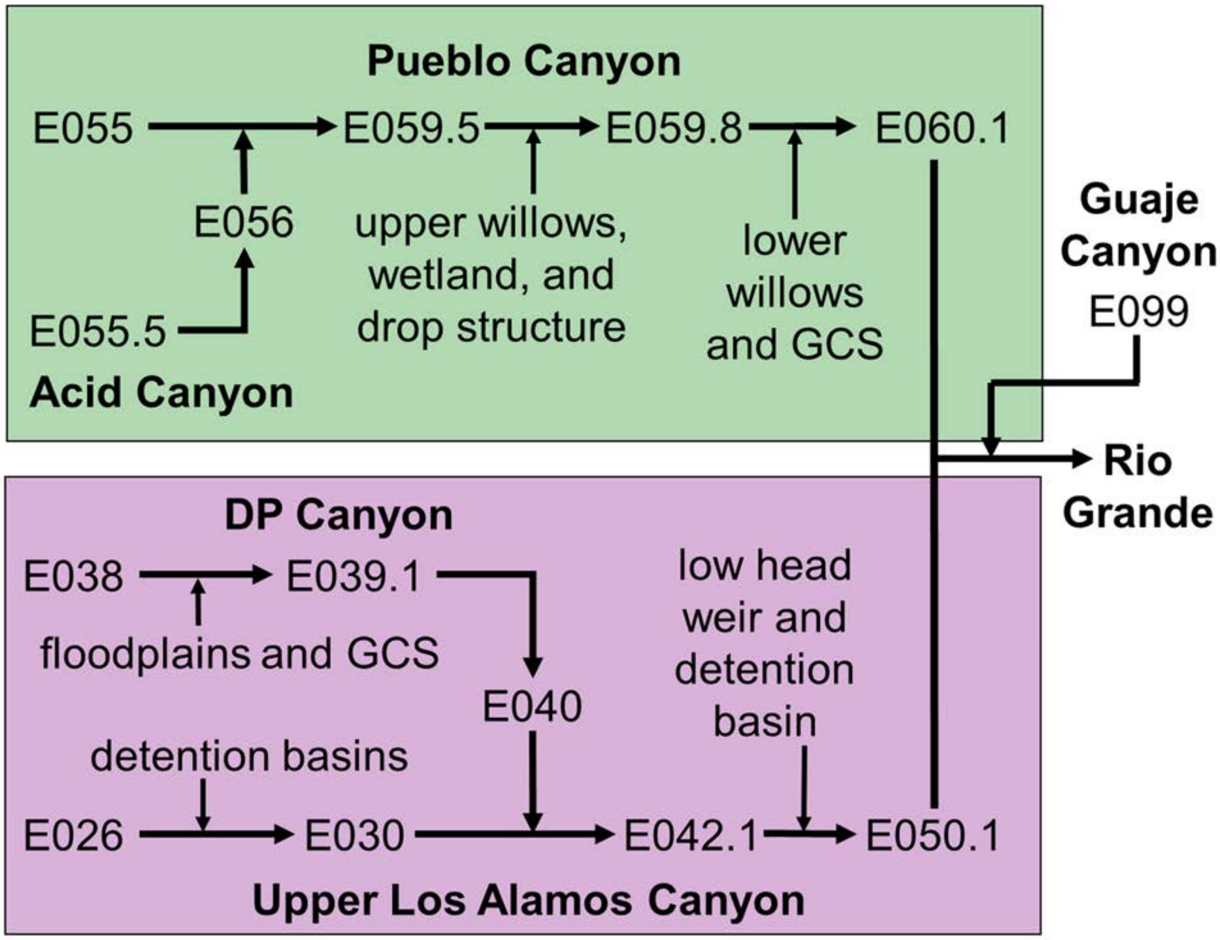


Figure 3.2-1 Flow diagram of gaging stations and sediment transport mitigation sites in the LA/P watershed

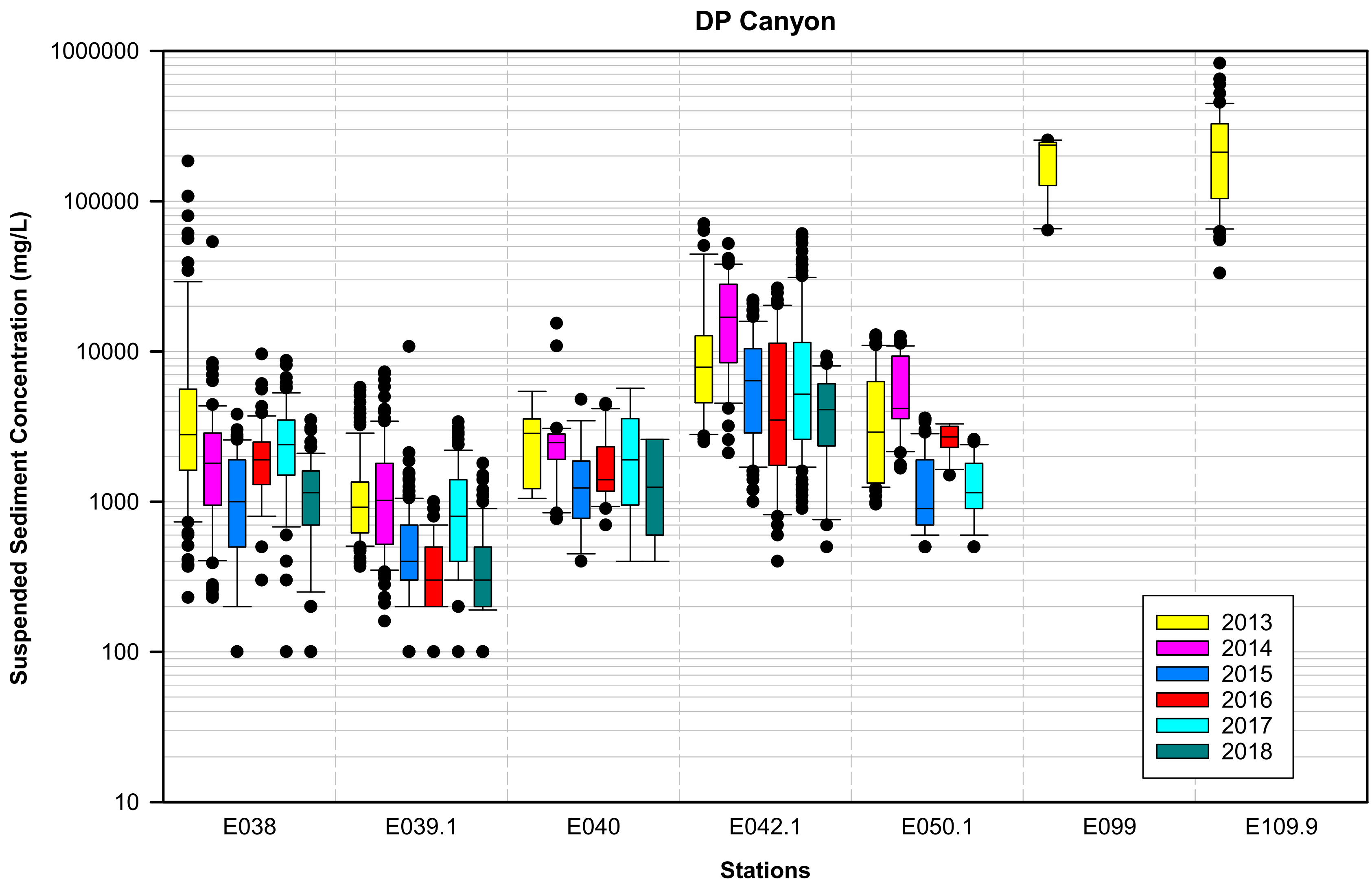


Figure 3.2-2 Box-and-whisker plots of SSC for all gaging stations in the LA/P watershed over the past 6 yr of monitoring

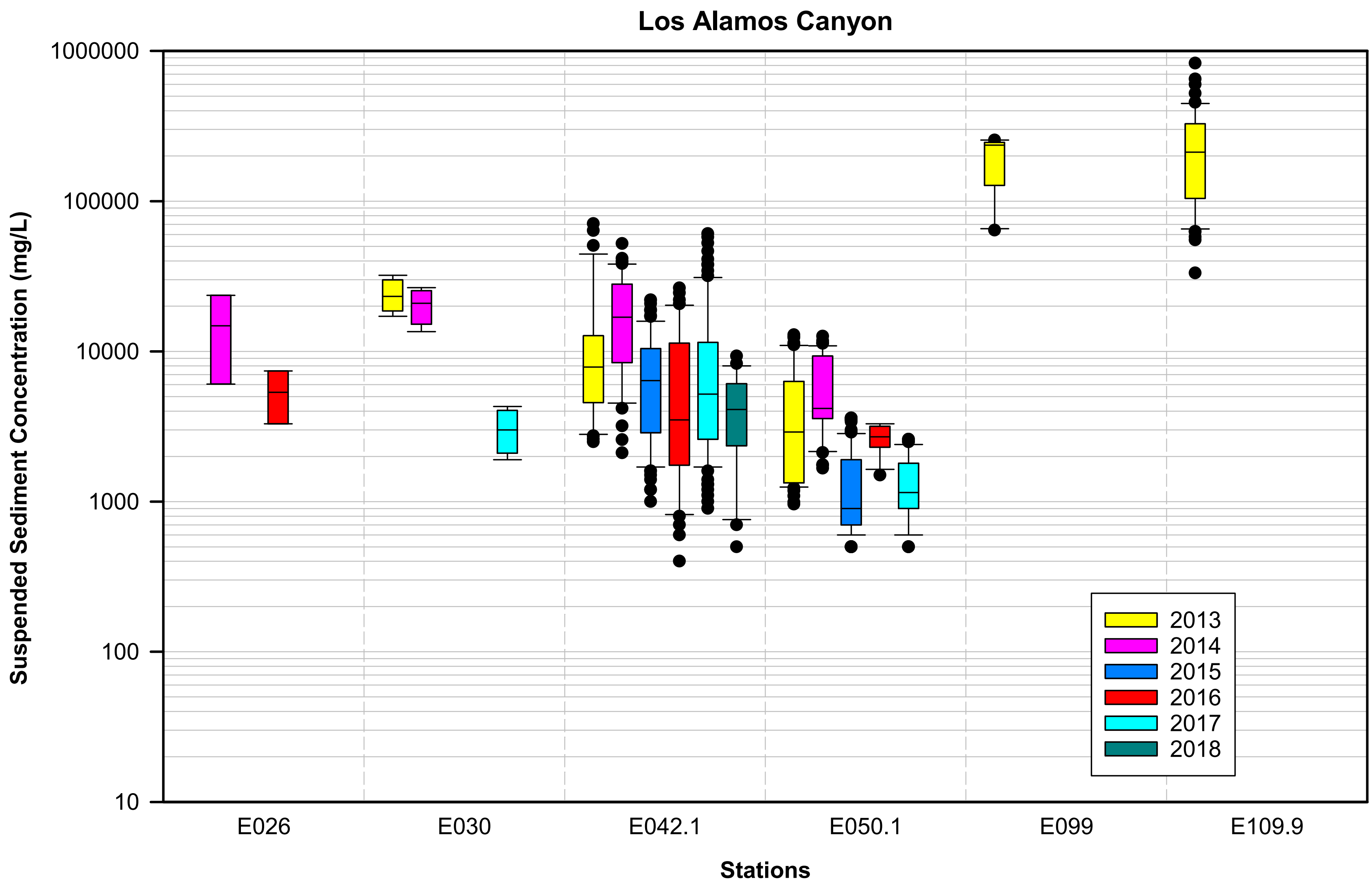


Figure 3.2-2 (continued) **Box-and-whisker plots of SSC for all gaging stations in the LA/P watershed over the past 6 yr of monitoring**

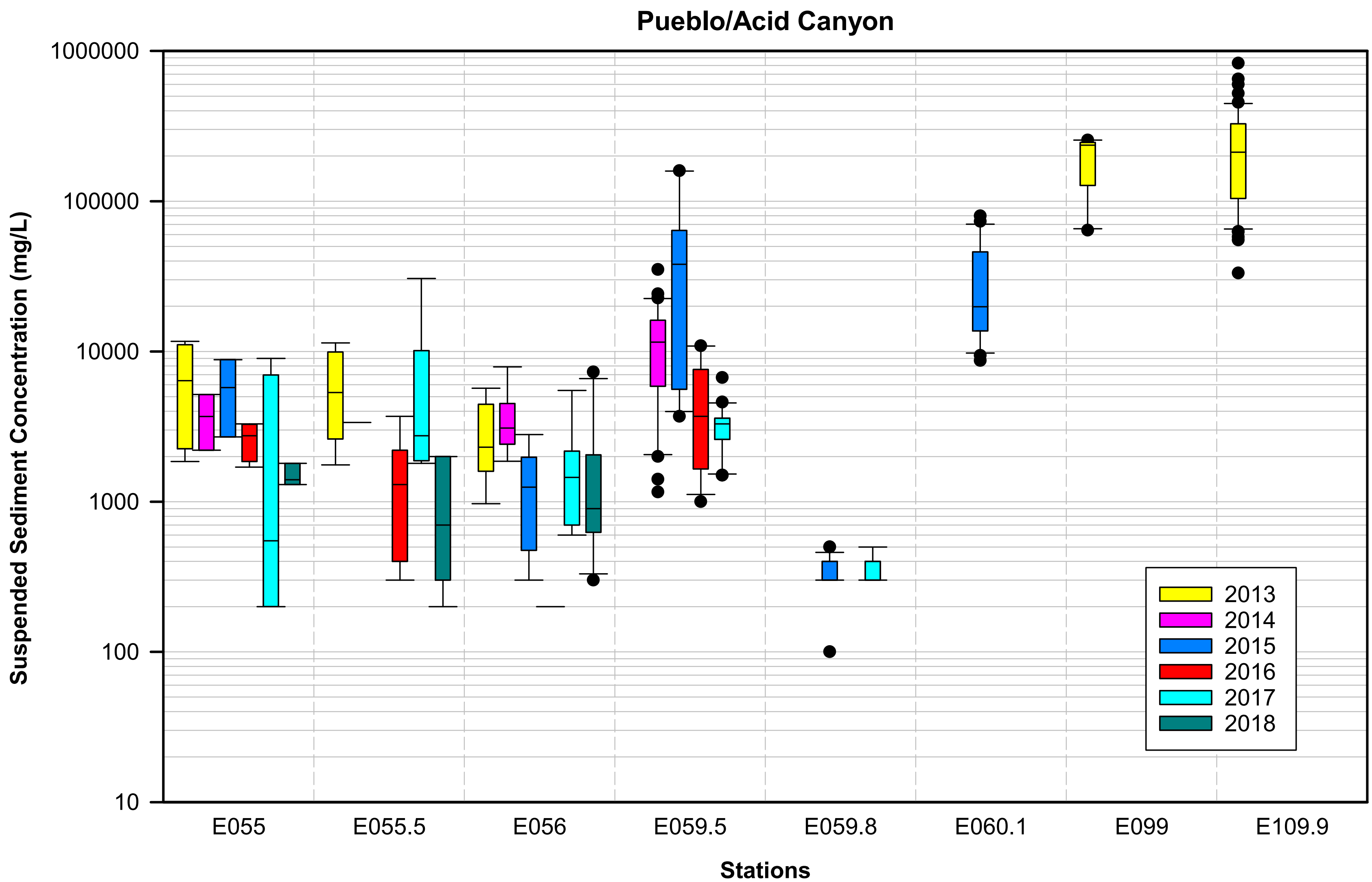
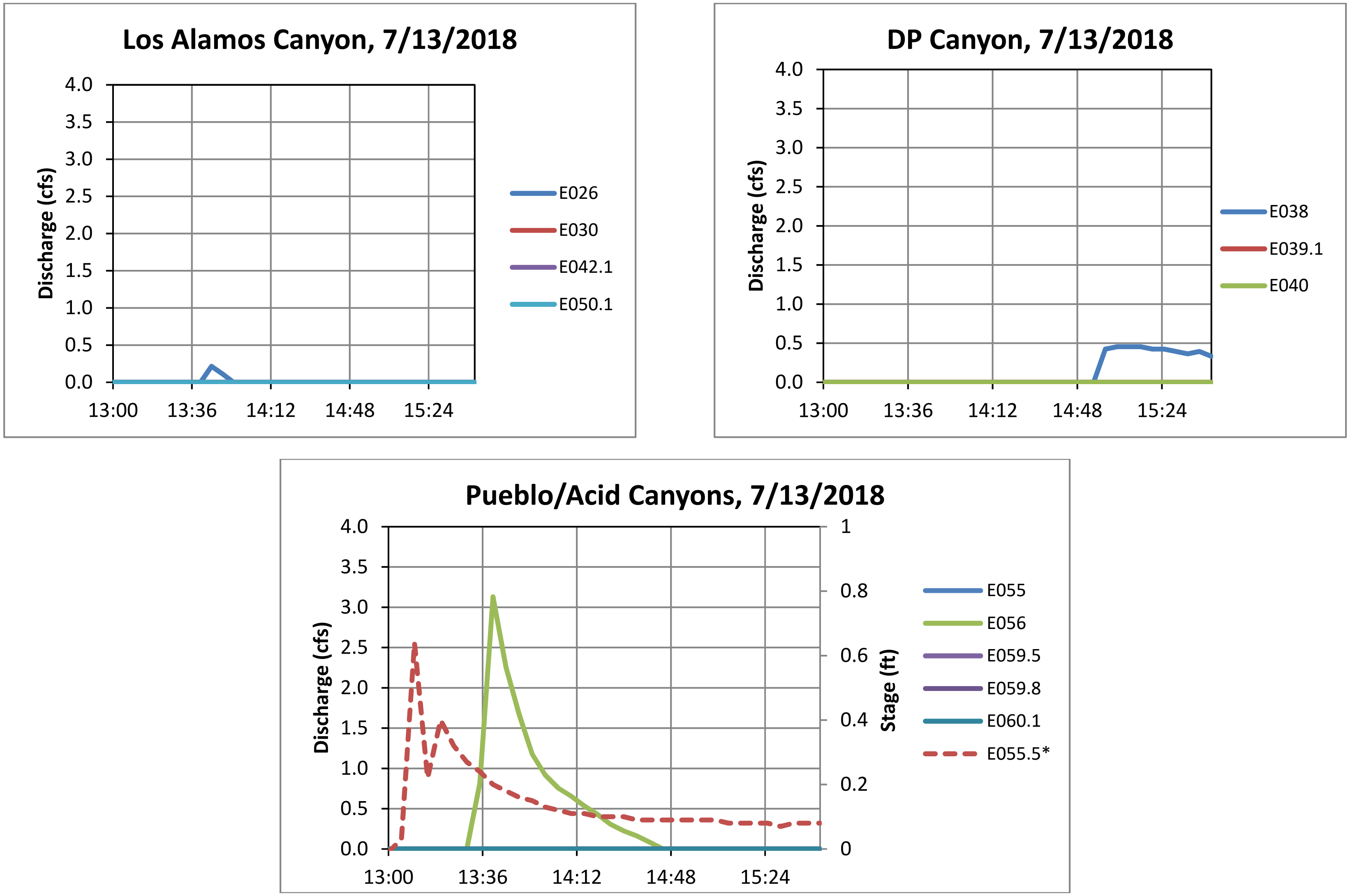
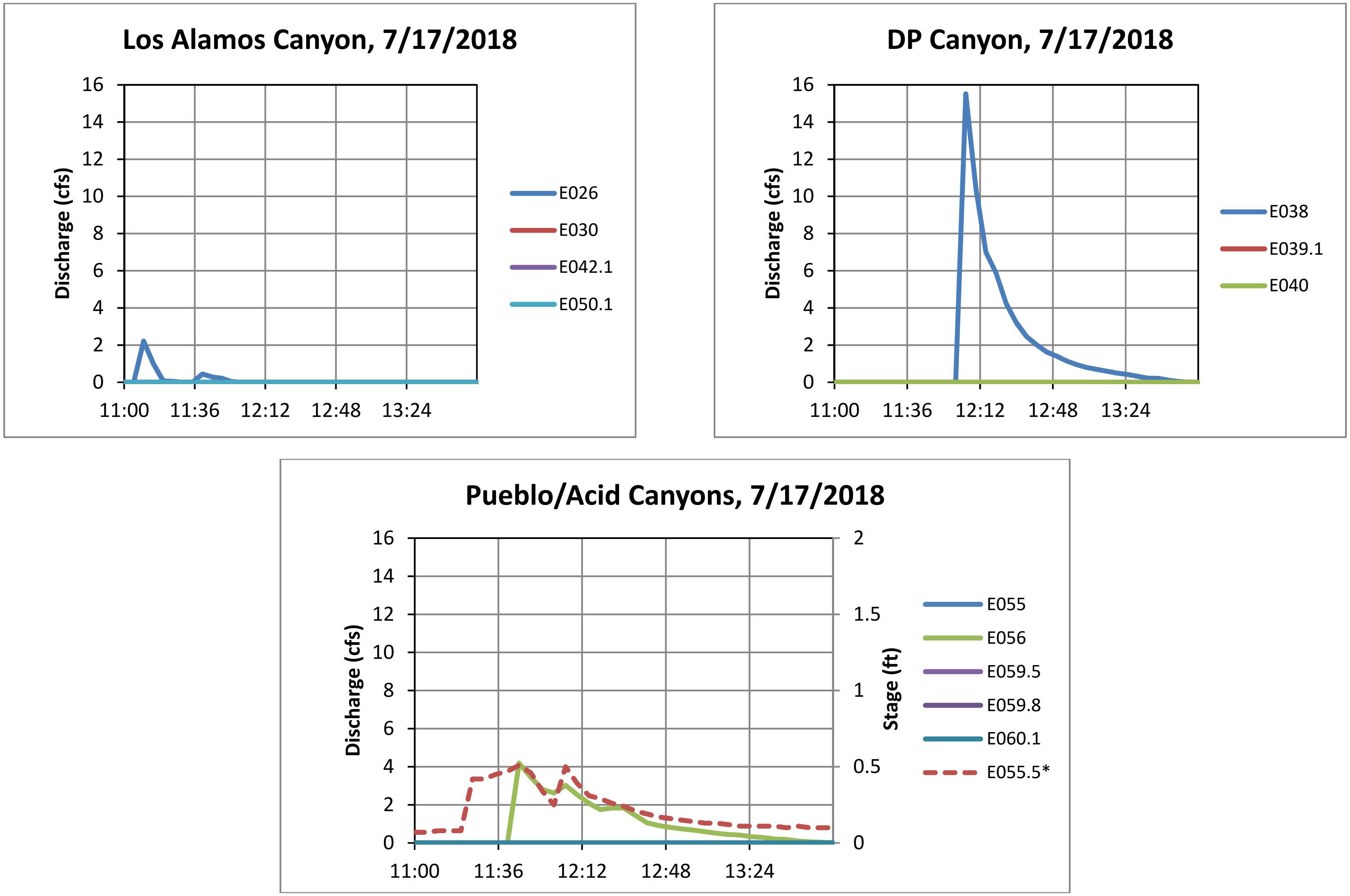


Figure 3.2-2 (continued) **Box-and-whisker plots of SSC for all gaging stations in the LA/P watershed over the past 6 yr of monitoring**



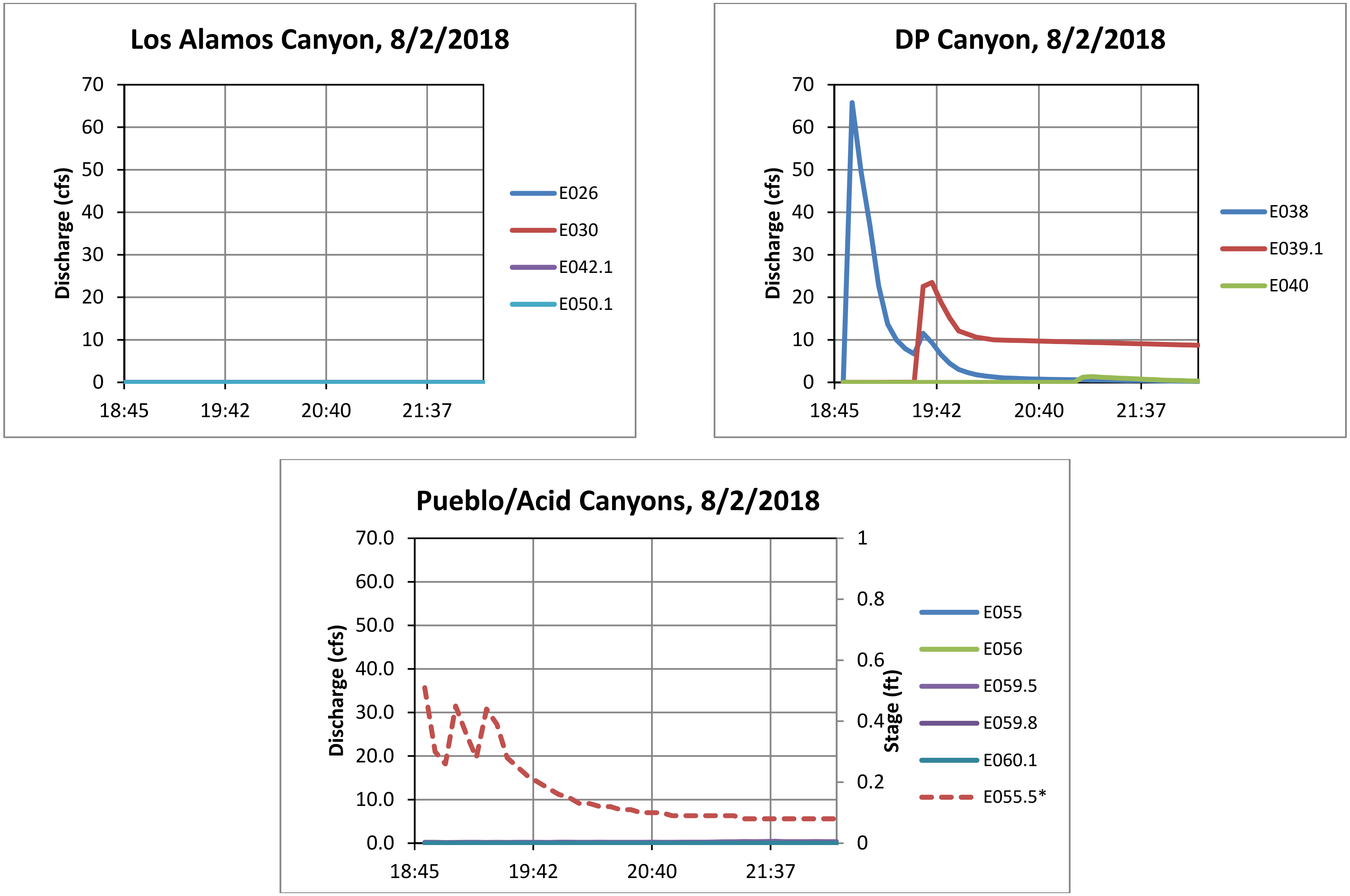
*Stage data is reported for E055.5

Figure 3.2-3 Hydrographs during each sample-triggering runoff event for each canyon from upstream to downstream reaches



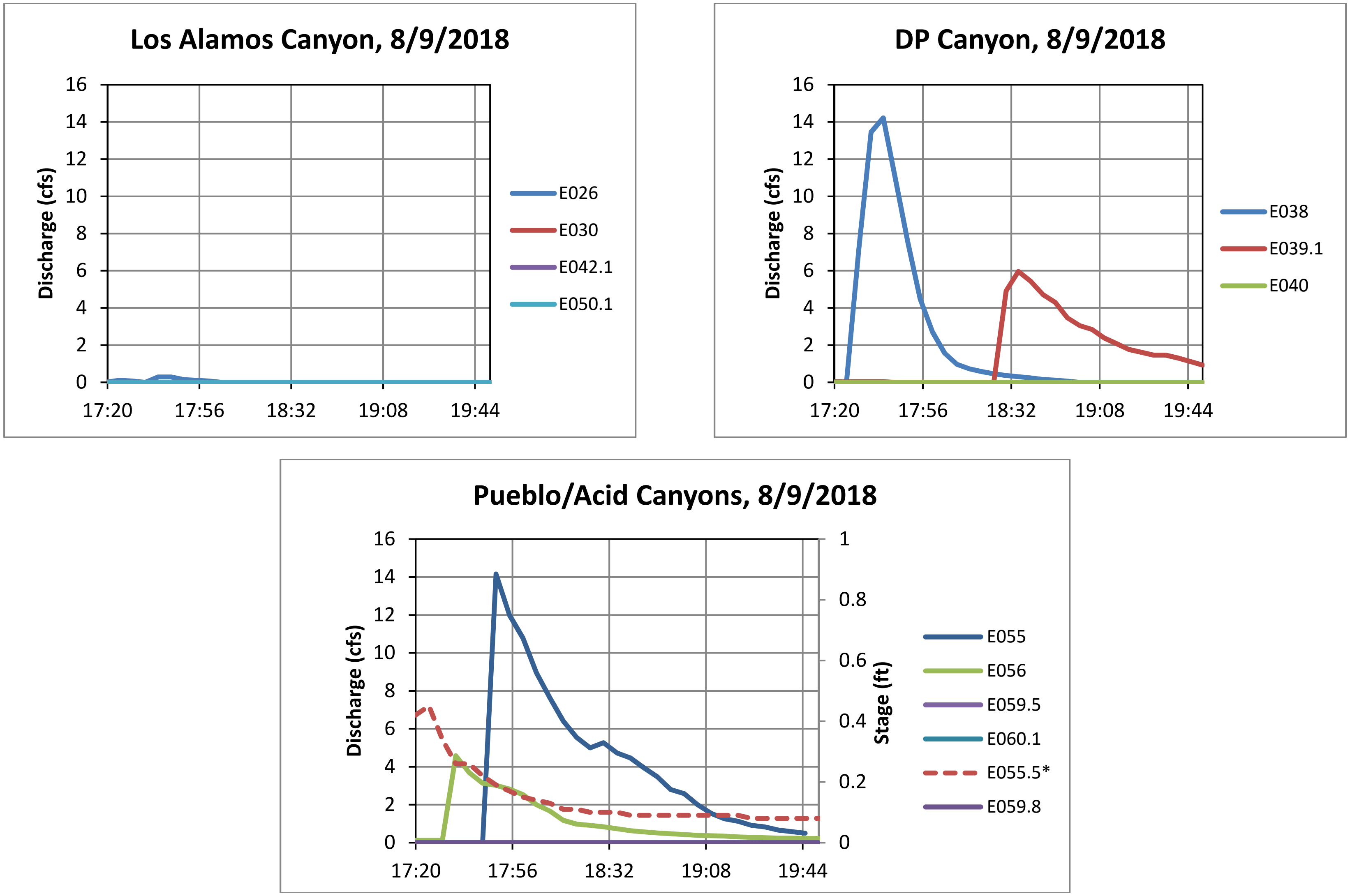
*Stage data is reported for E055.5

Figure 3.2-3 (continued) **Hydrographs during each sample-triggering runoff event for each canyon from upstream to downstream reaches**



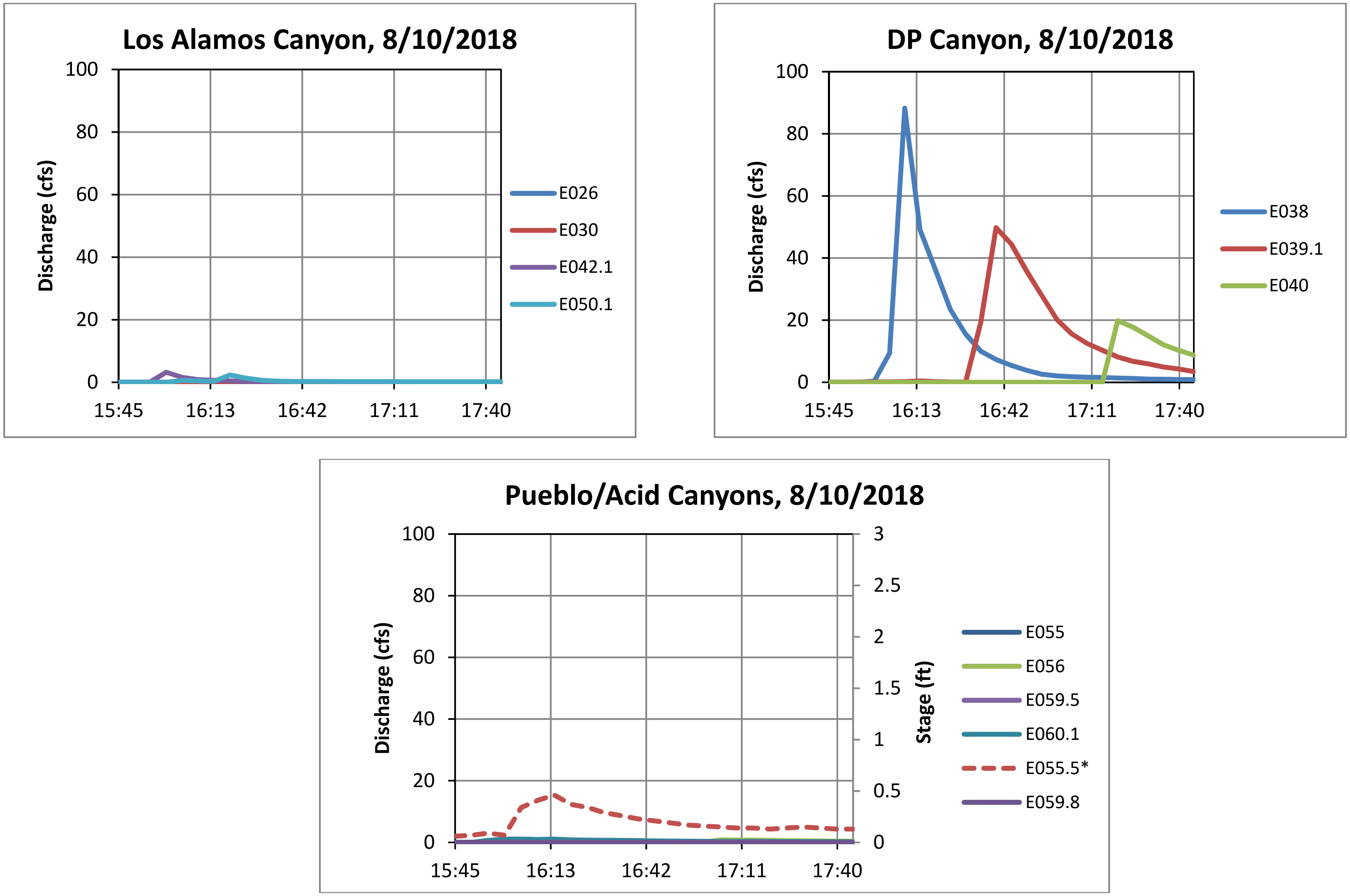
*Stage data is reported for E055.5

Figure 3.2-3 (continued) Hydrographs during each sample-triggering runoff event for each canyon from upstream to downstream reaches



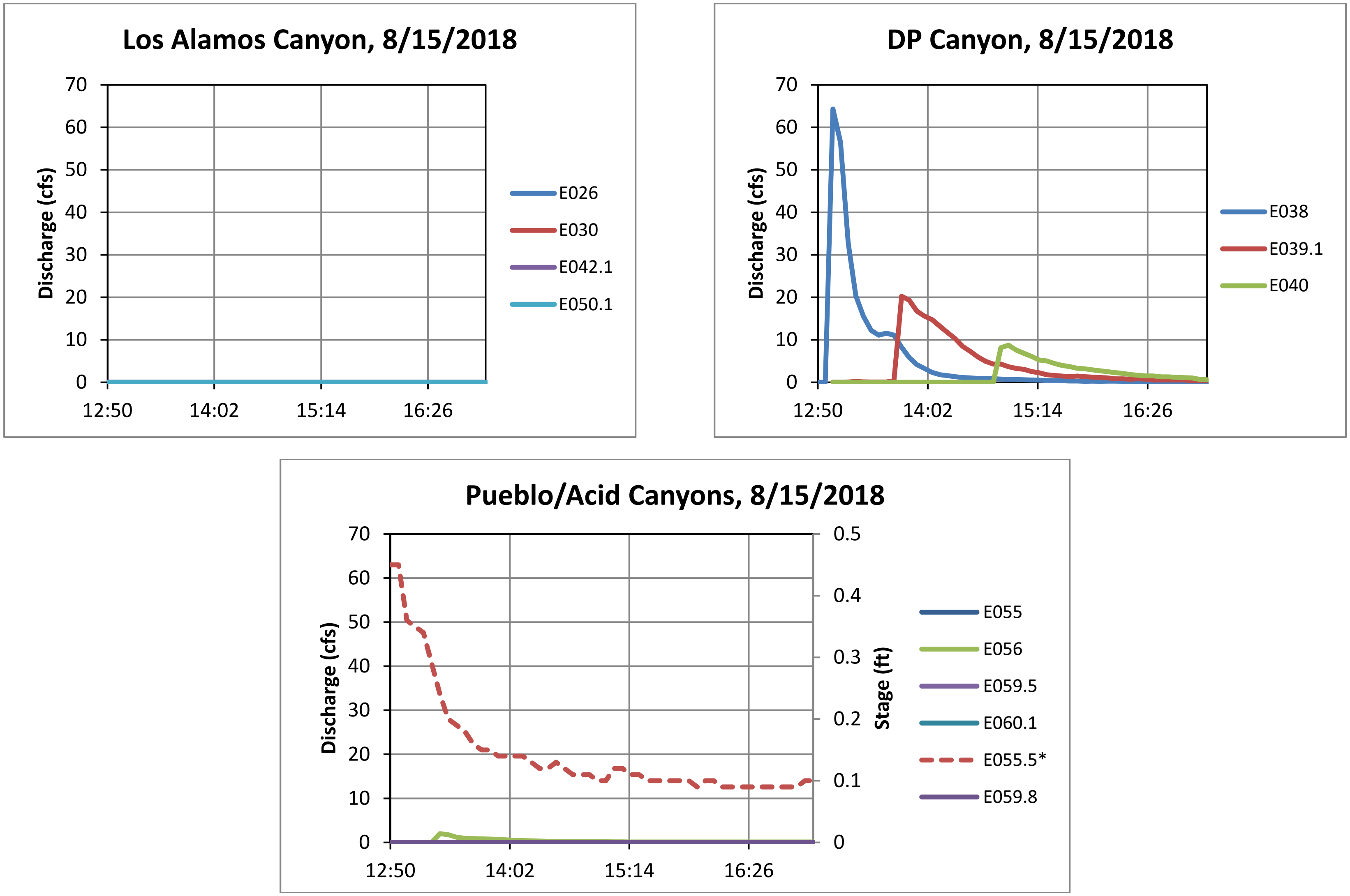
*Stage data is reported for E055.5

Figure 3.2-3 (continued) **Hydrographs during each sample-triggering runoff event for each canyon from upstream to downstream reaches**



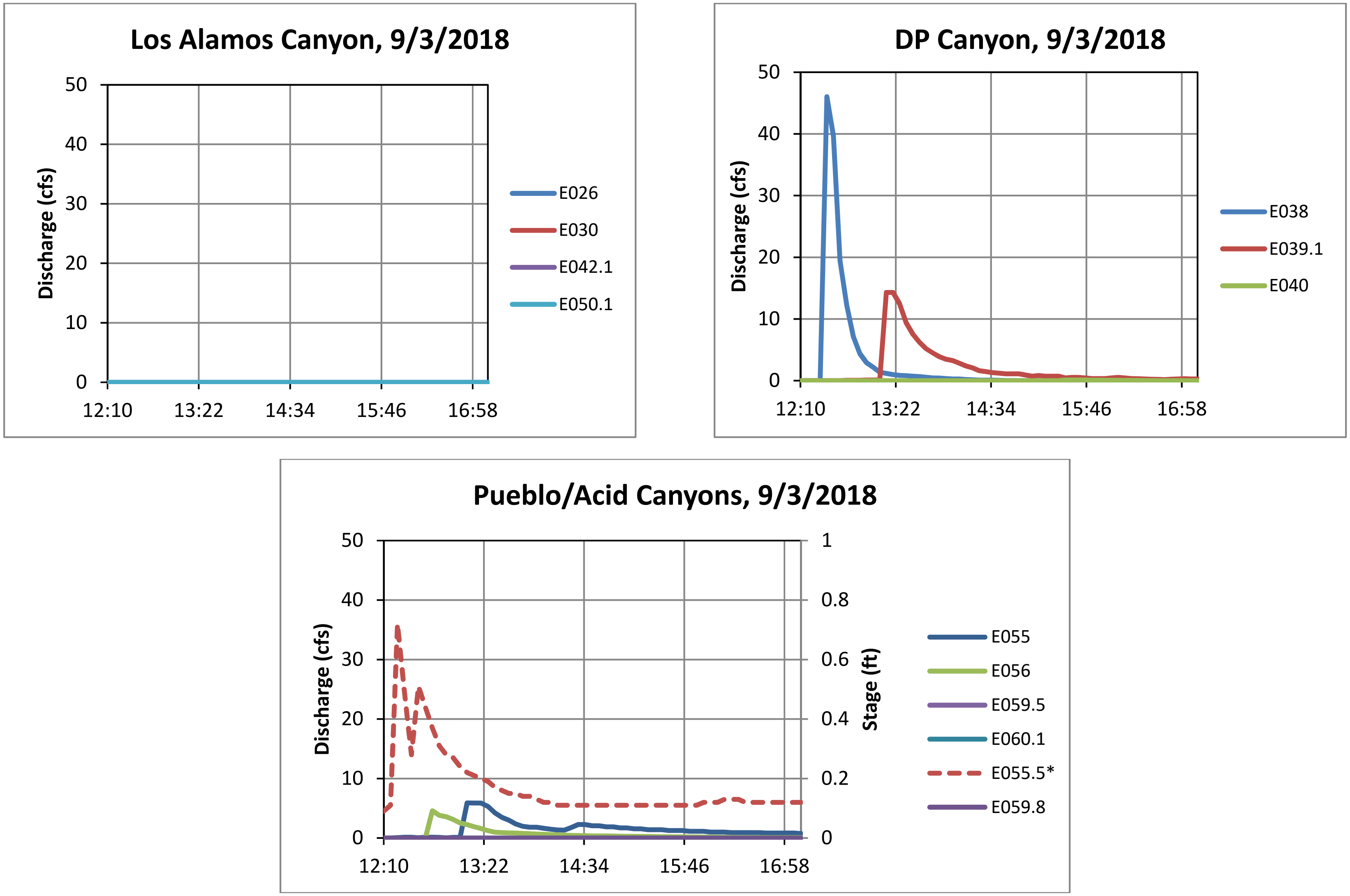
*Stage data is reported for E055.5

Figure 3.2-3 (continued) **Hydrographs during each sample-triggering runoff event for each canyon from upstream to downstream reaches**



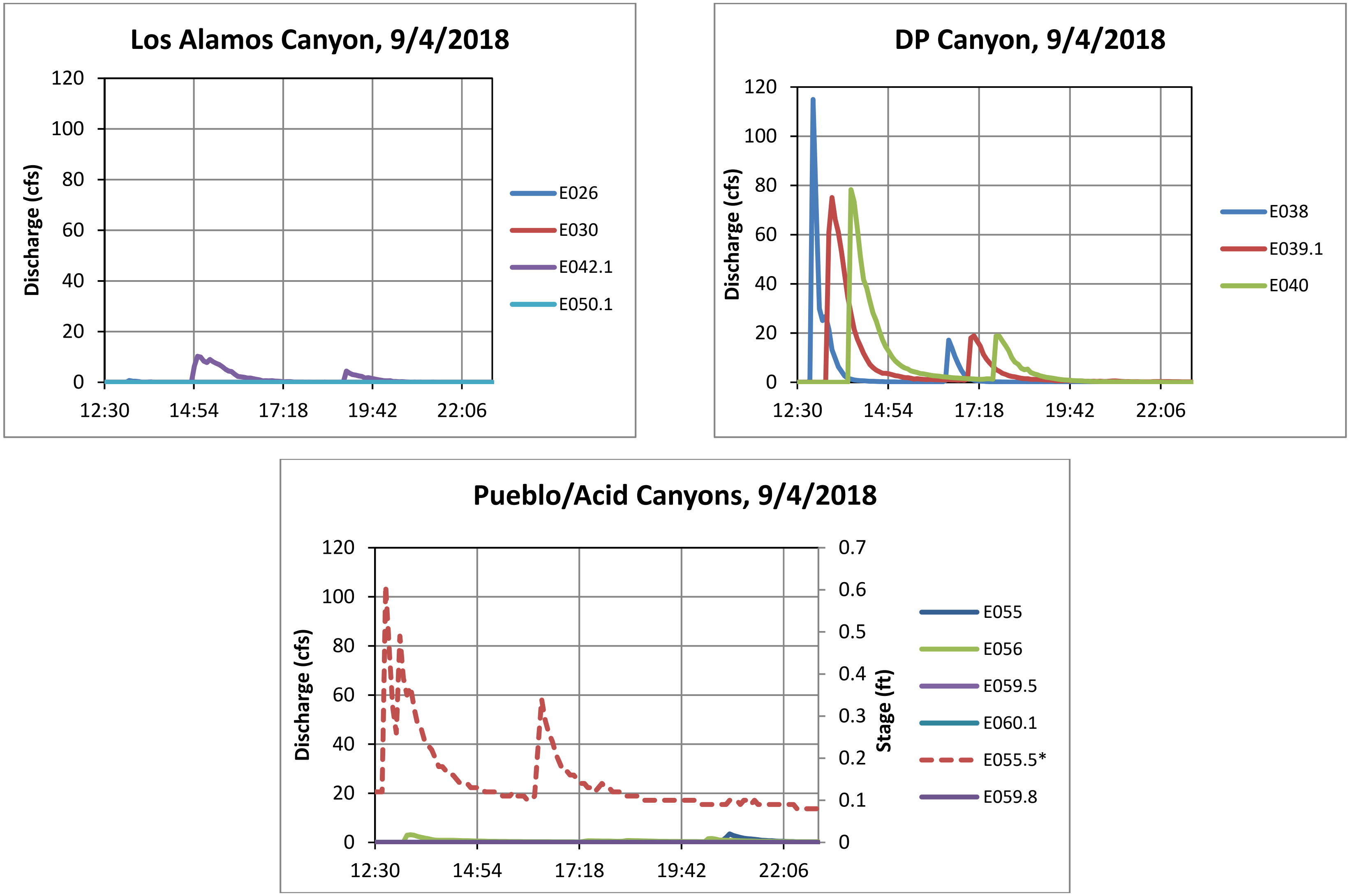
*Stage data is reported for E055.5

Figure 3.2-3 (continued) Hydrographs during each sample-triggering runoff event for each canyon from upstream to downstream reaches



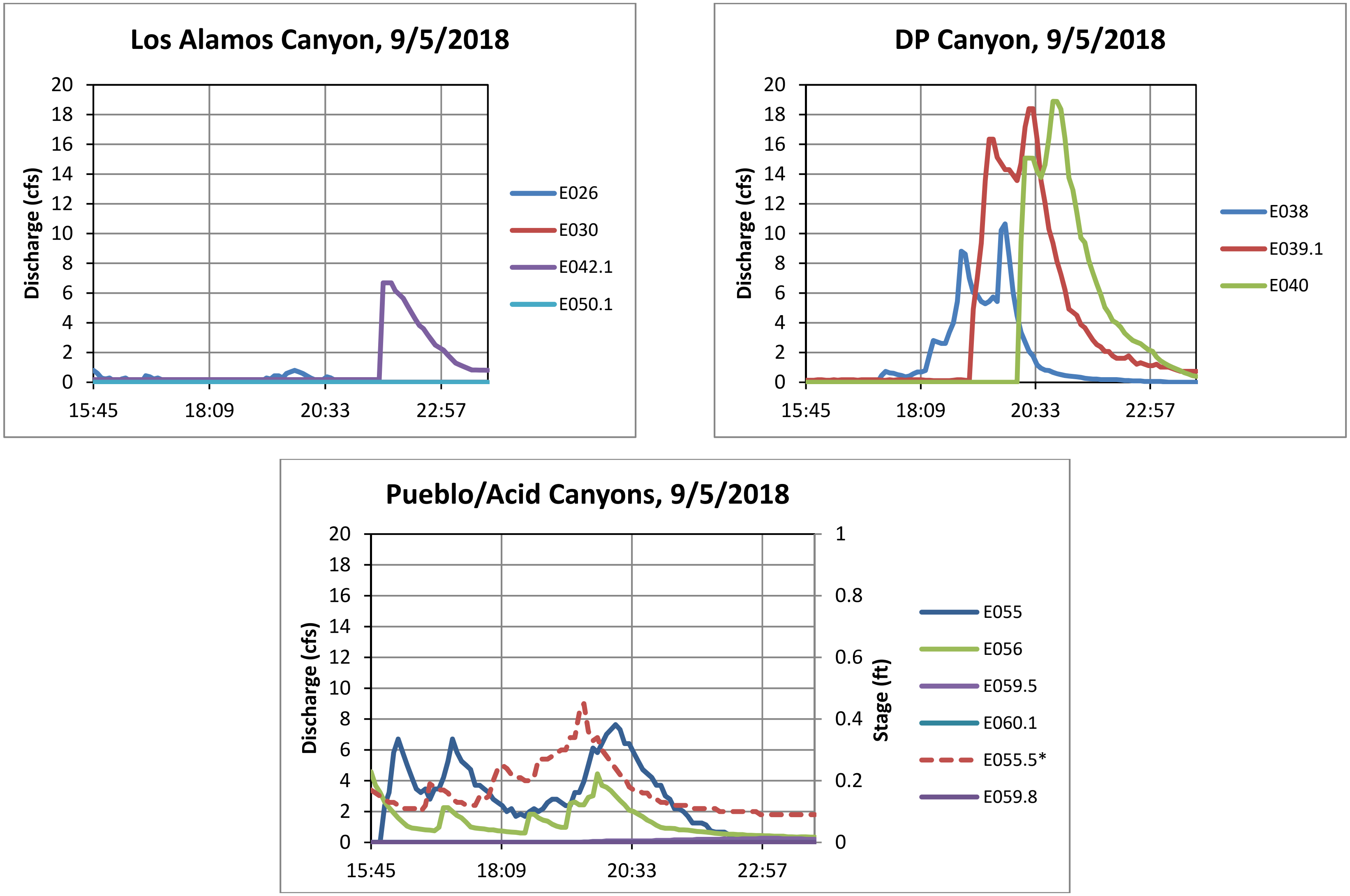
*Stage data is reported for E055.5

Figure 3.2-3 (continued) Hydrographs during each sample-triggering runoff event for each canyon from upstream to downstream reaches



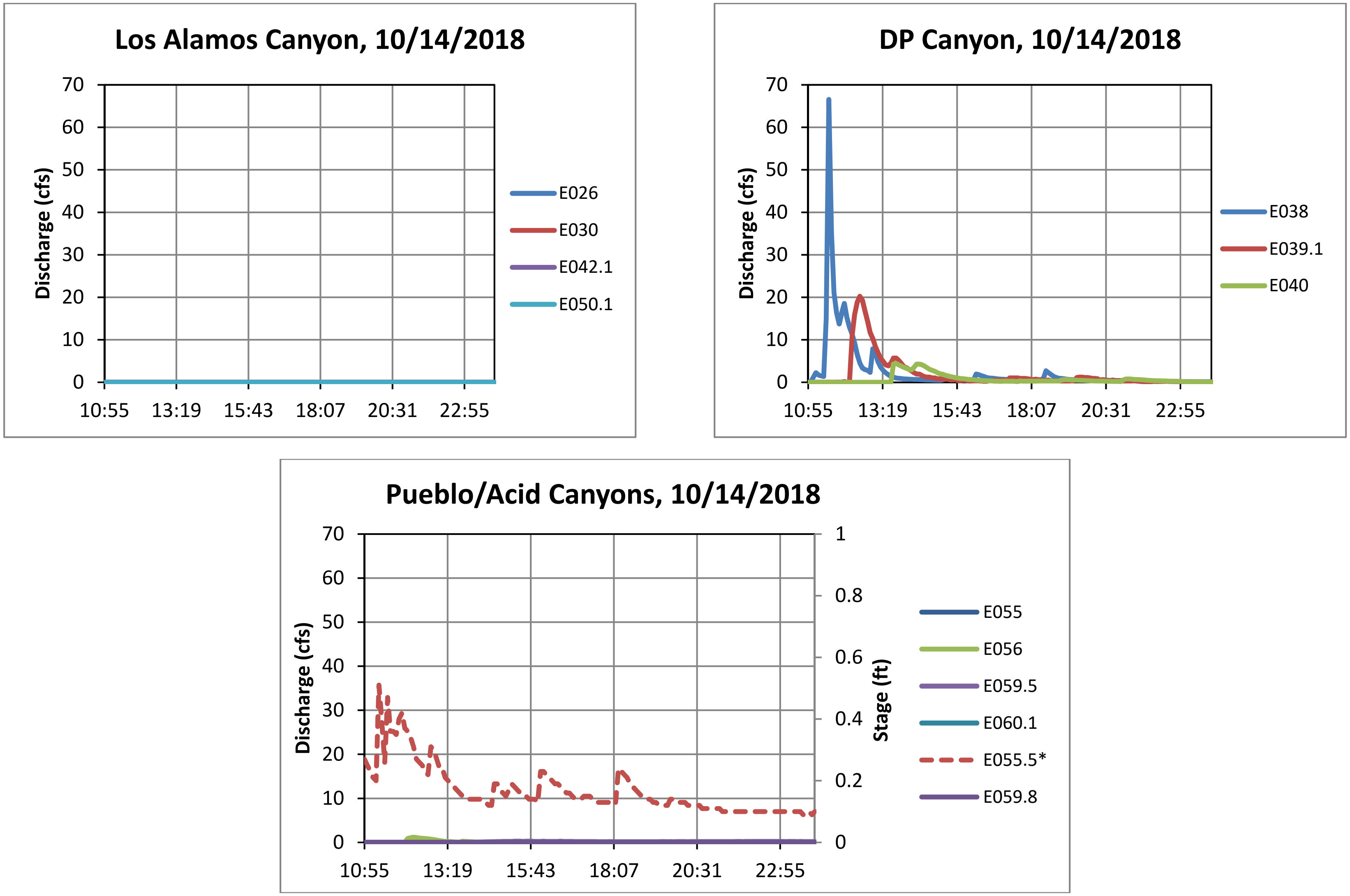
*Stage data is reported for E055.5

Figure 3.2-3 (continued) **Hydrographs during each sample-triggering runoff event for each canyon from upstream to downstream reaches**



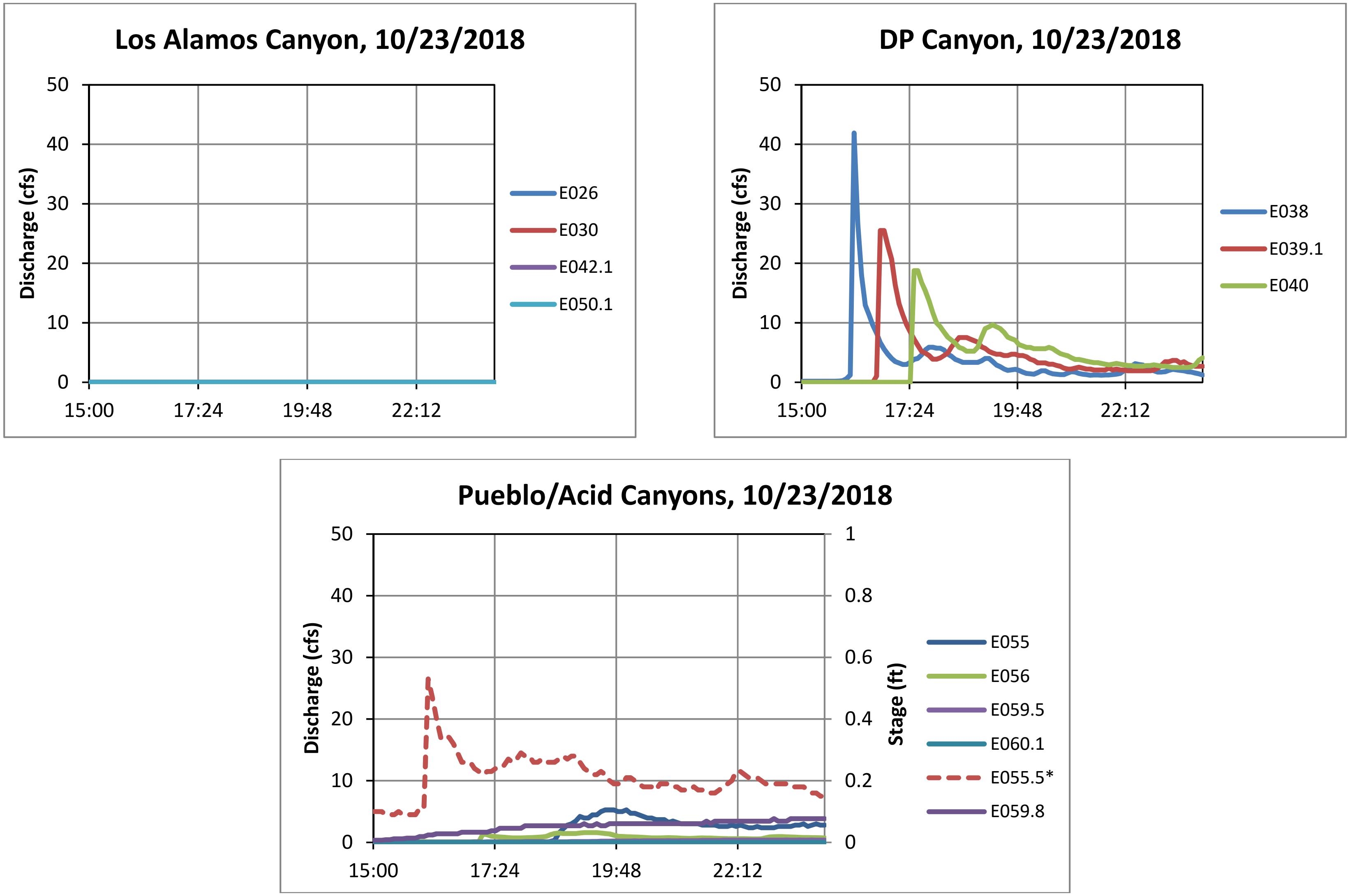
*Stage data is reported for E055.5

Figure 3.2-3 (continued) Hydrographs during each sample-triggering runoff event for each canyon from upstream to downstream reaches



*Stage data is reported for E055.5

Figure 3.2-3 (continued) **Hydrographs during each sample-triggering runoff event for each canyon from upstream to downstream reaches**



*Stage data is reported for E055.5

Figure 3.2-3 (continued) **Hydrographs during each sample-triggering runoff event for each canyon from upstream to downstream reaches**

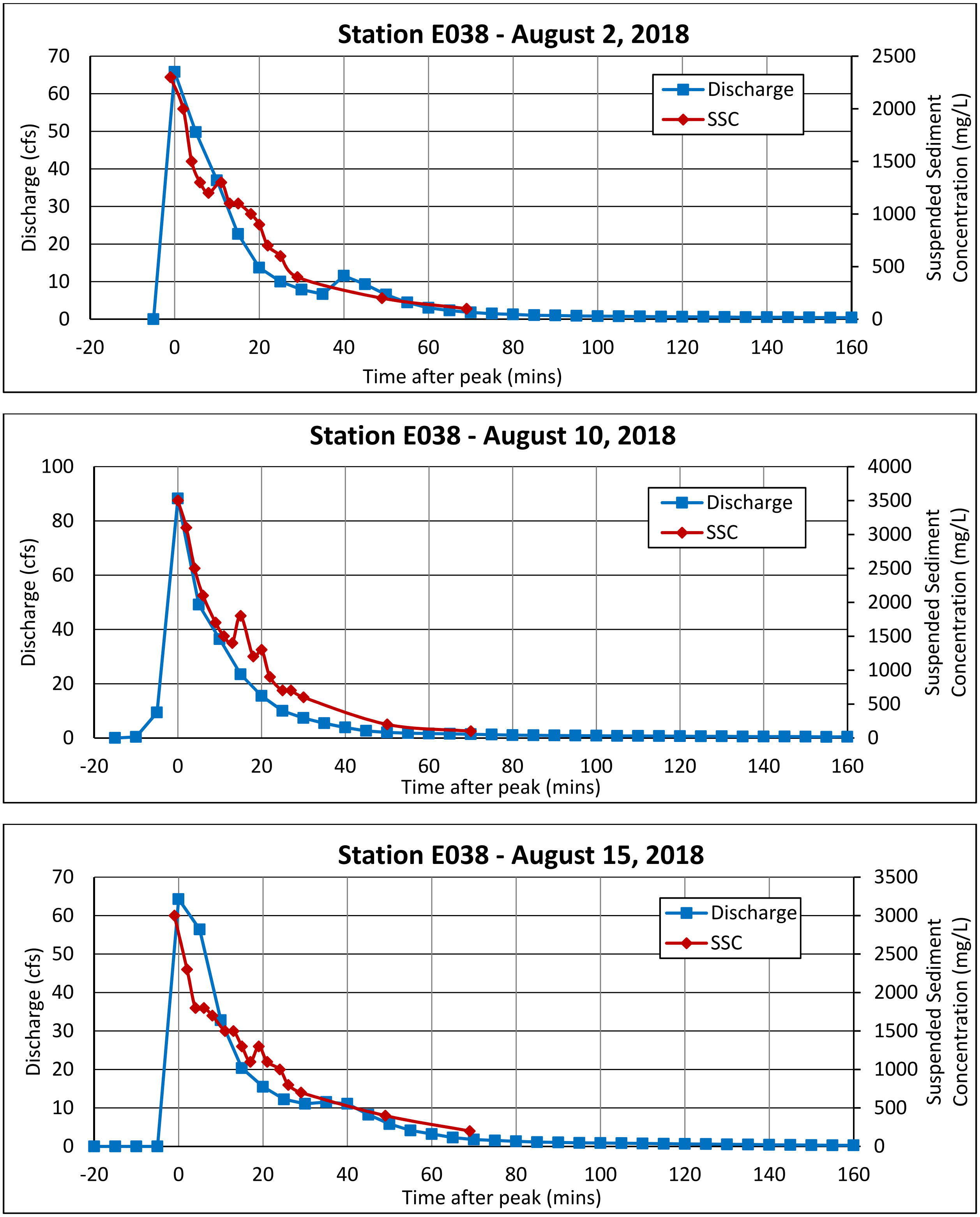
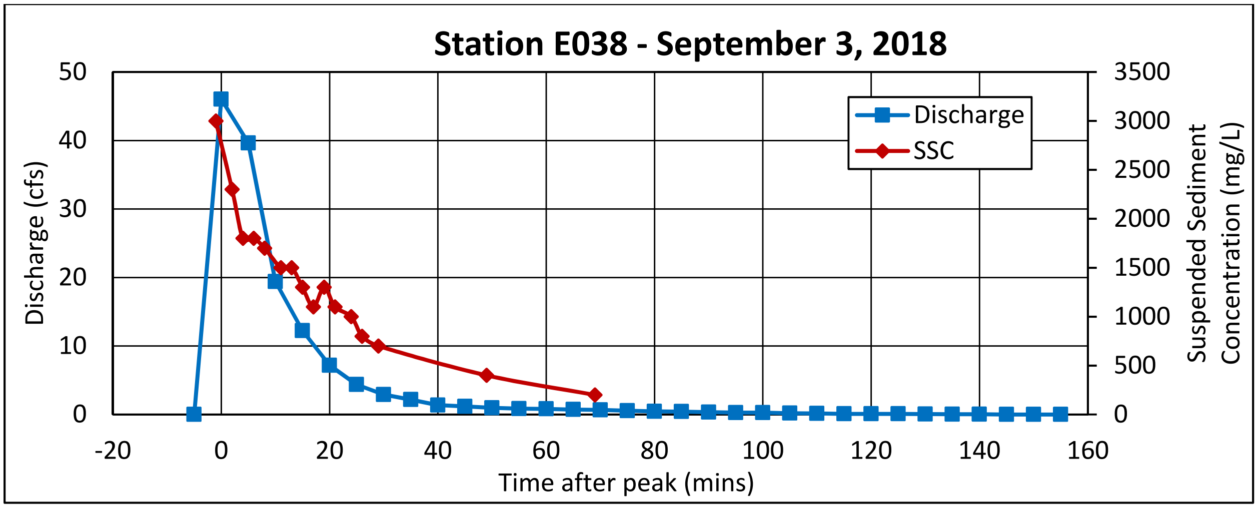
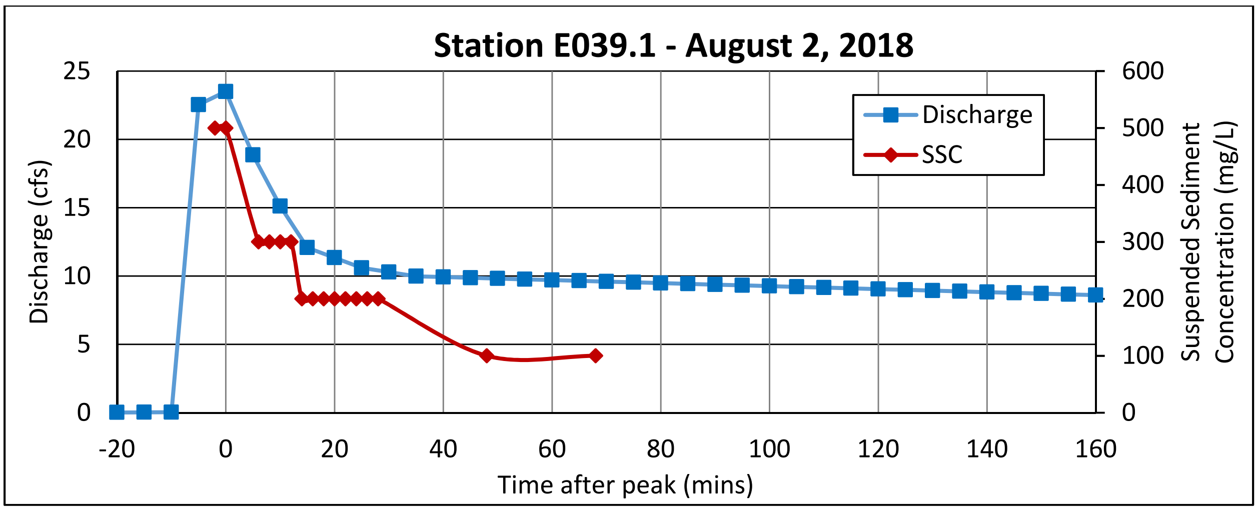


Figure 3.2-4 Discharge and SSC for events sampled at E038, E039.1, and E042.1





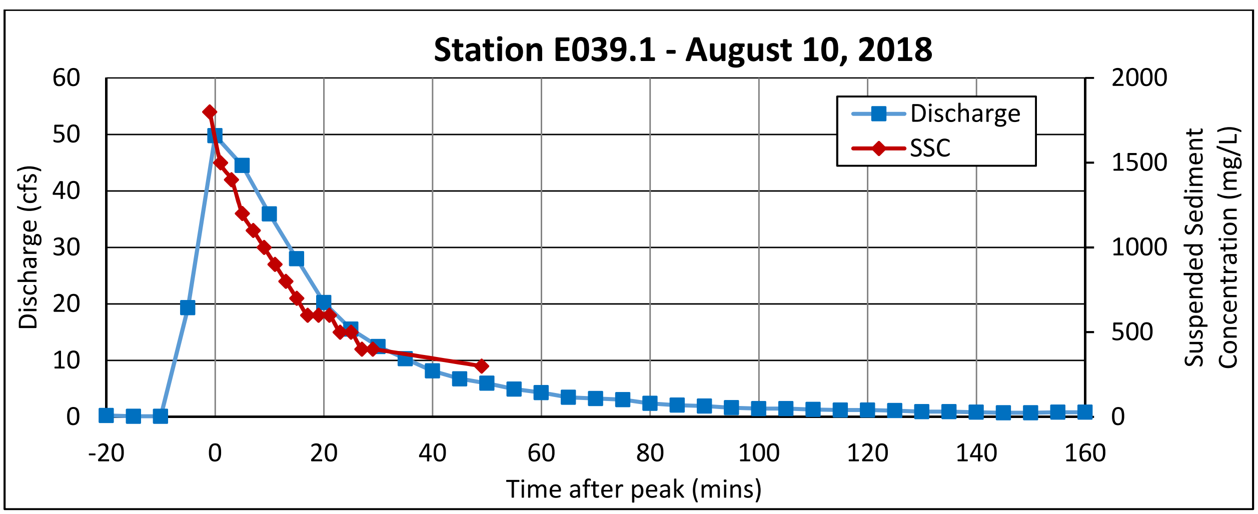


Figure 3.2-4 (continued) Discharge and SSC for events sampled at E038, E039.1, and E042.1

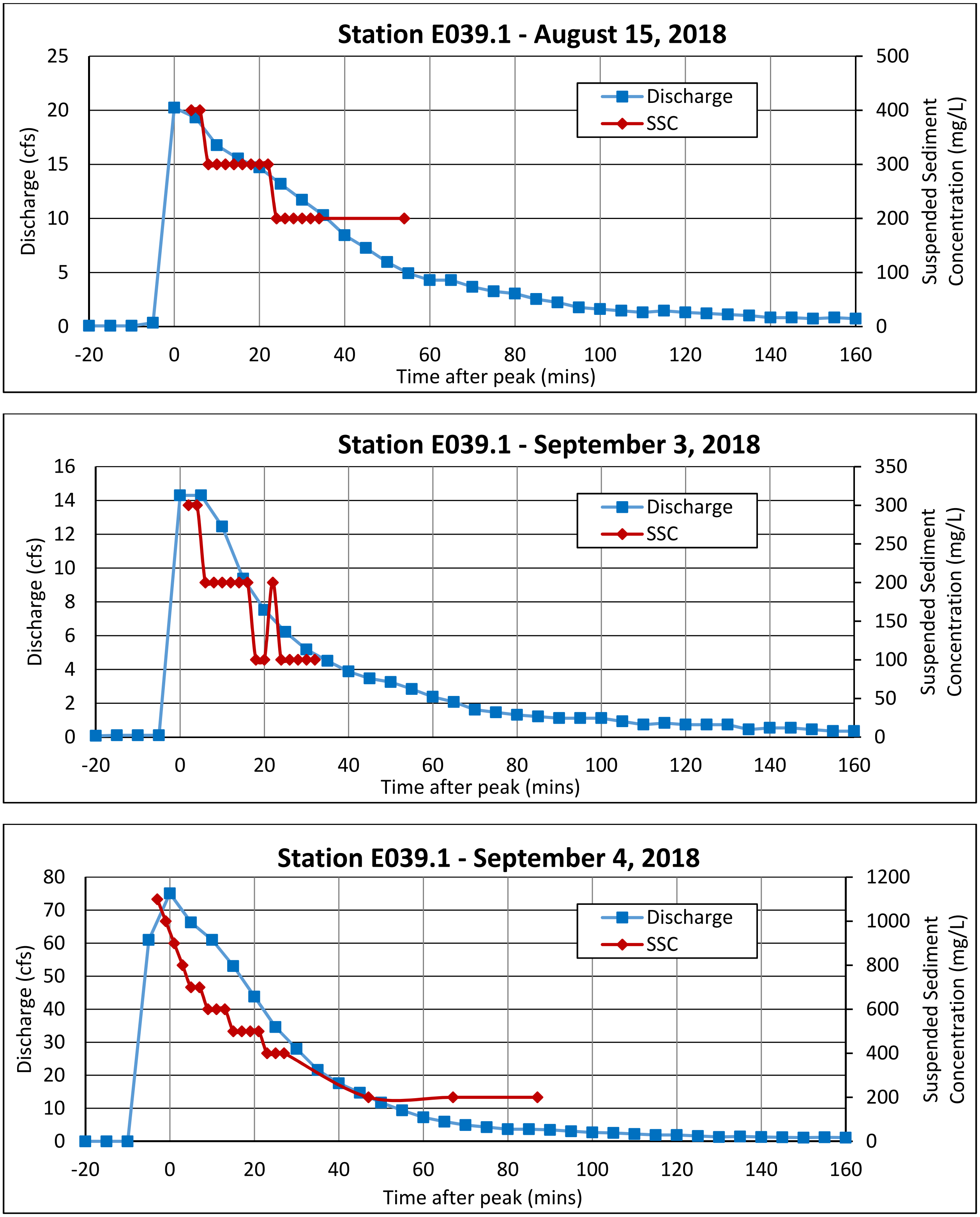


Figure 3.2-4 (continued) **Discharge and SSC for events sampled at E038, E039.1, and E042.1**

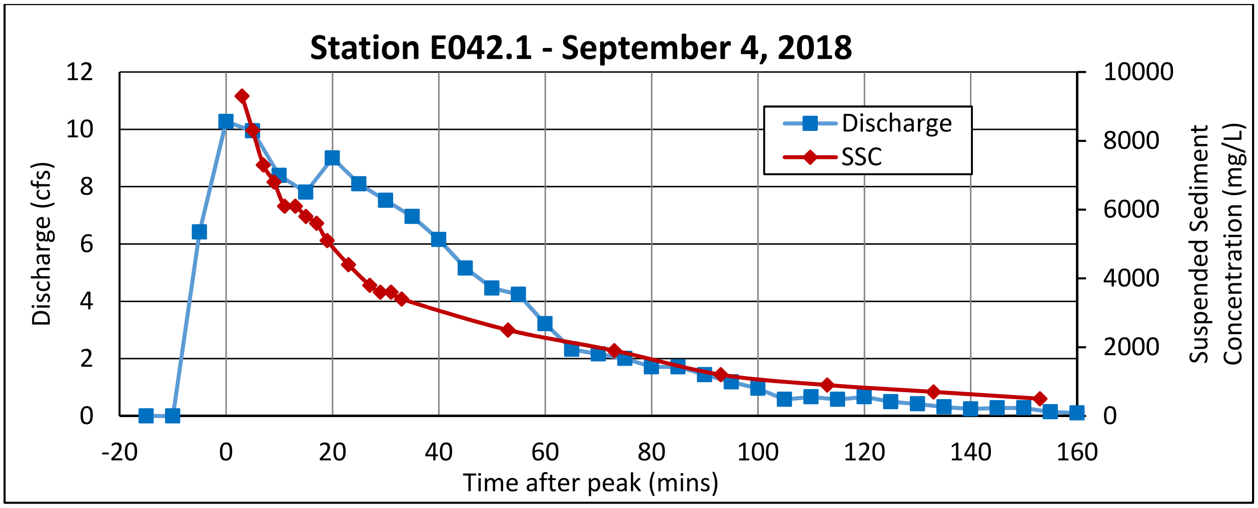


Figure 3.2-4 (continued) **Discharge and SSC for events sampled at E038, E039.1, and E042.1**

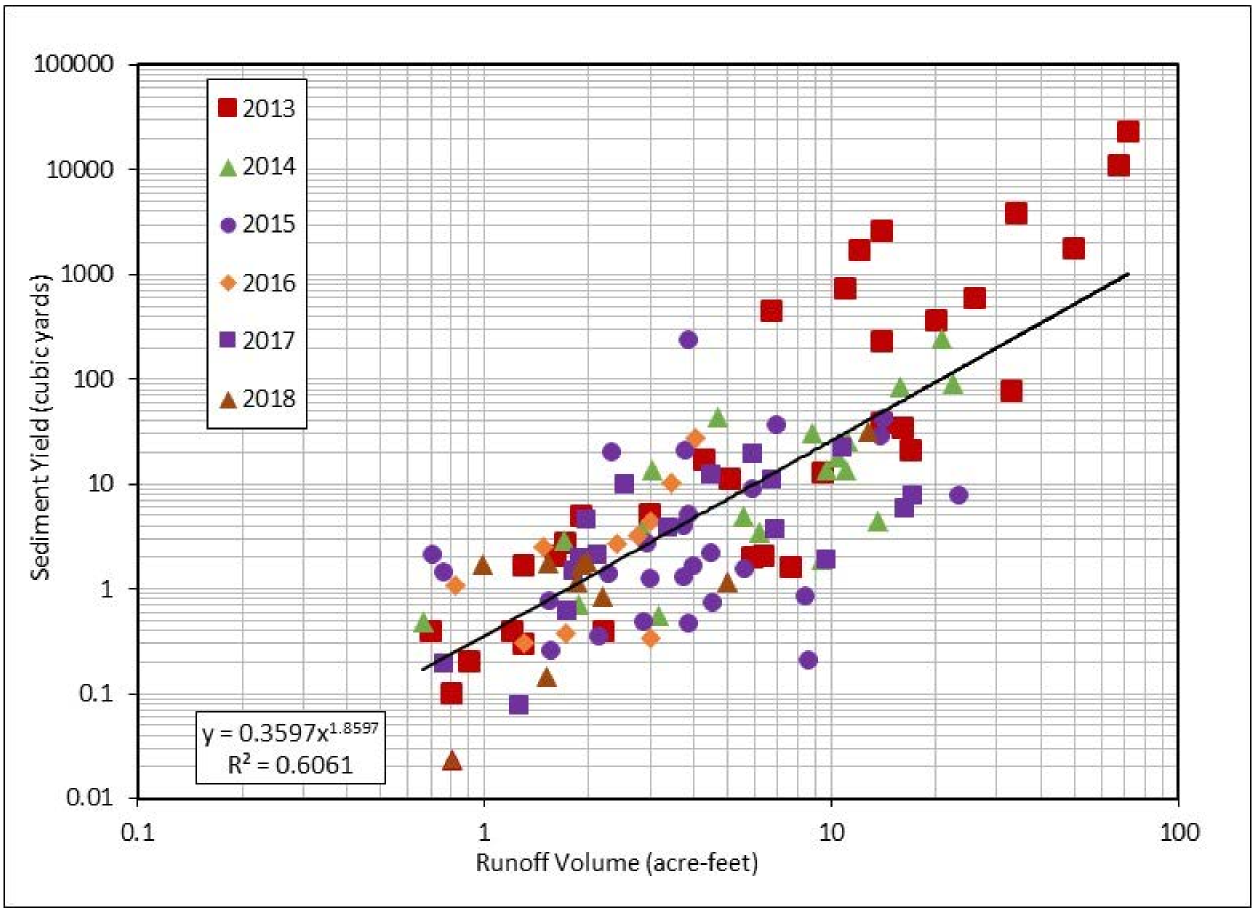


Figure 3.2-5 **Relationship between SSC-based sediment yield and runoff volume over the past 6 yr of monitoring**

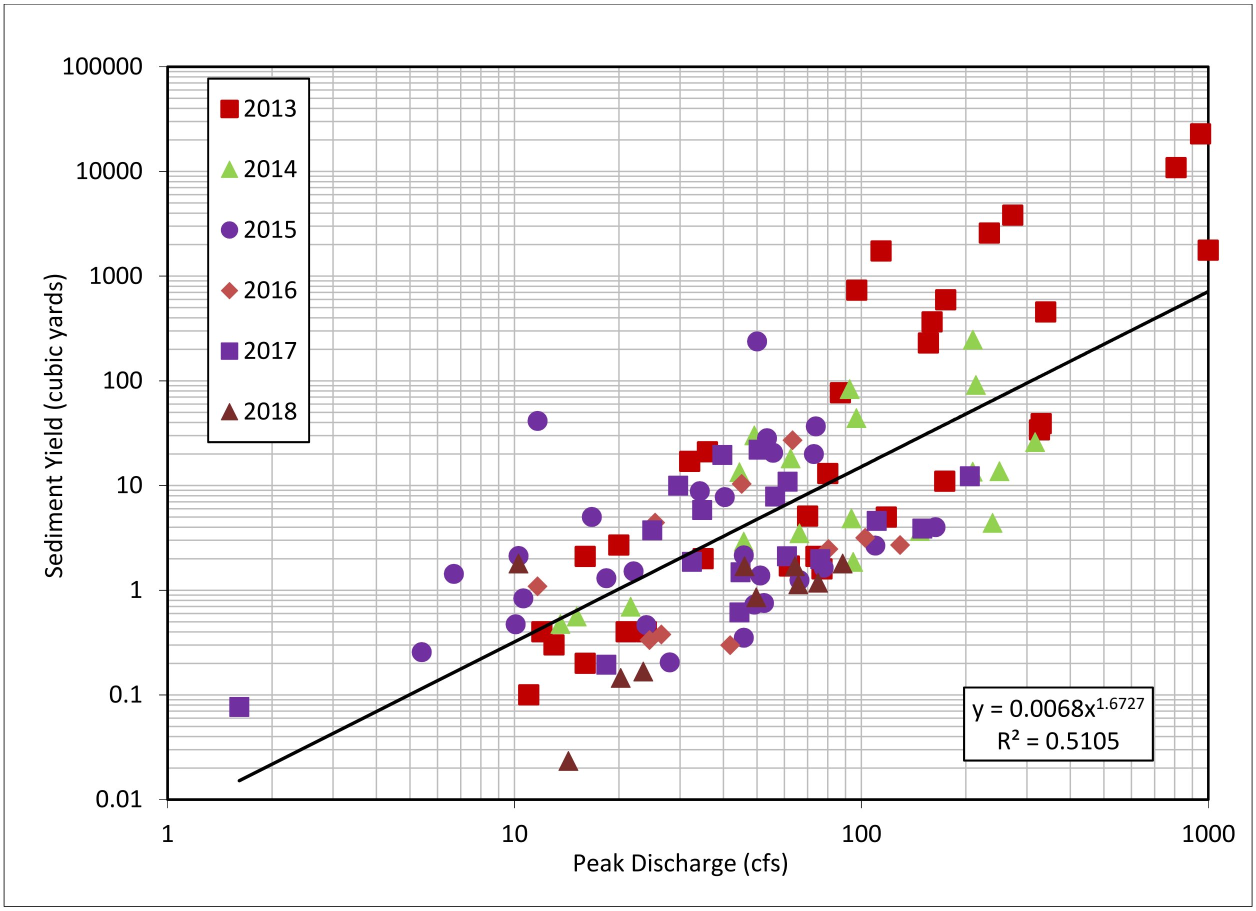


Figure 3.2-6 Relationship between SSC-based sediment yield and peak discharge over the past 6 yr of monitoring

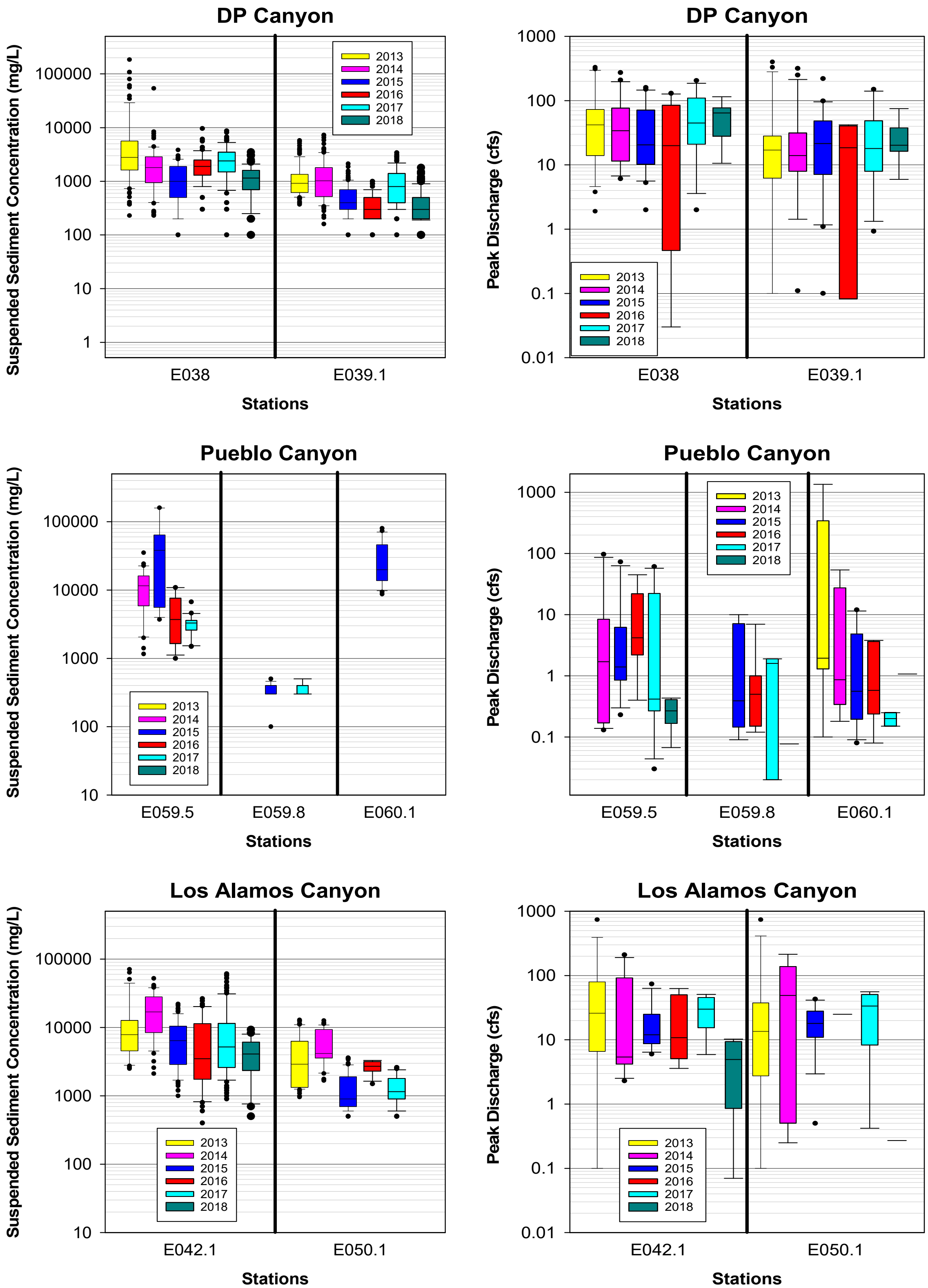


Figure 3.4-1 **Box-and-whisker plots of SSC (left) and peak discharge (right) upstream and downstream of the watershed mitigations in DP (top), Pueblo (middle), and Los Alamos (bottom) Canyons over the past 6 yr of monitoring**

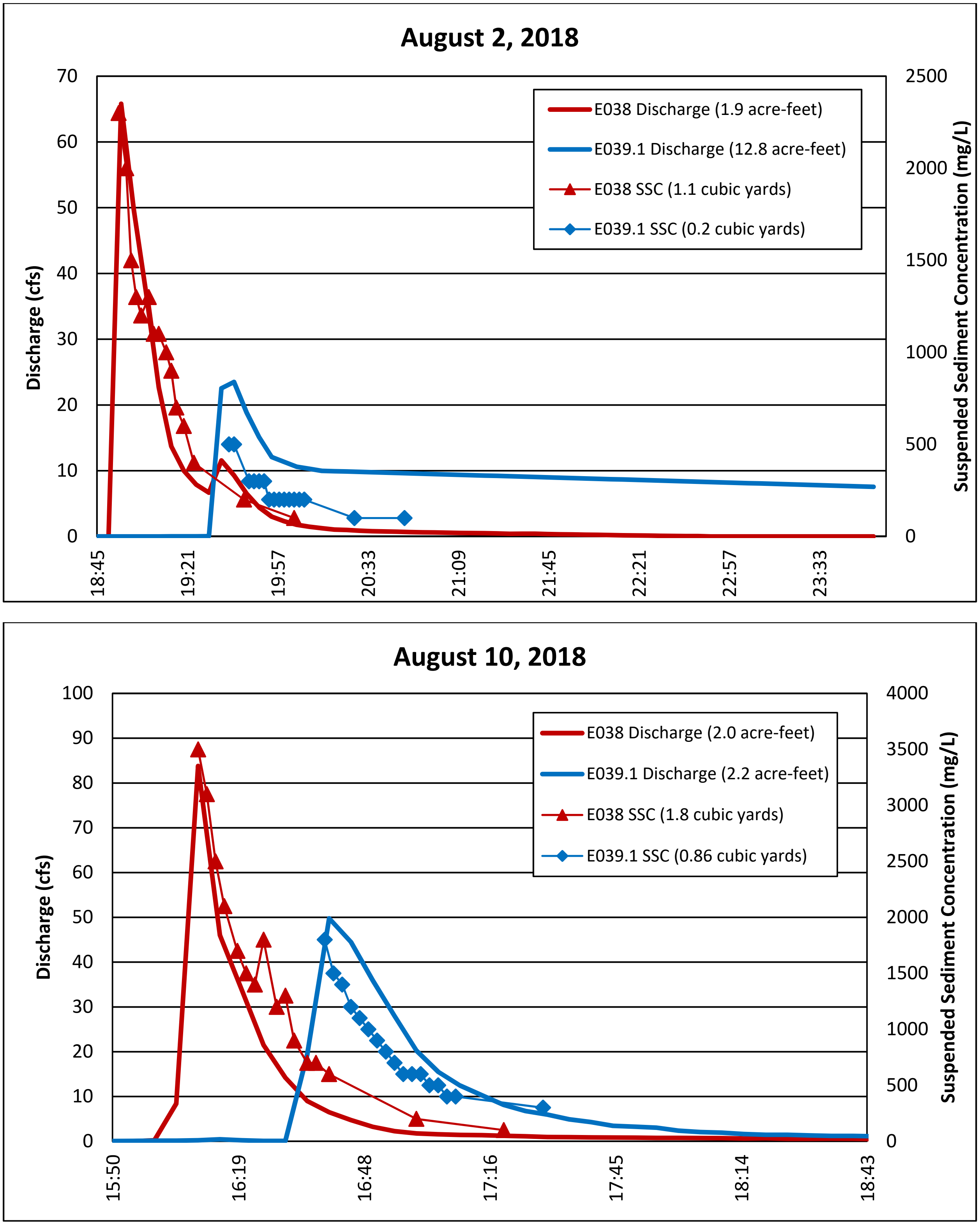
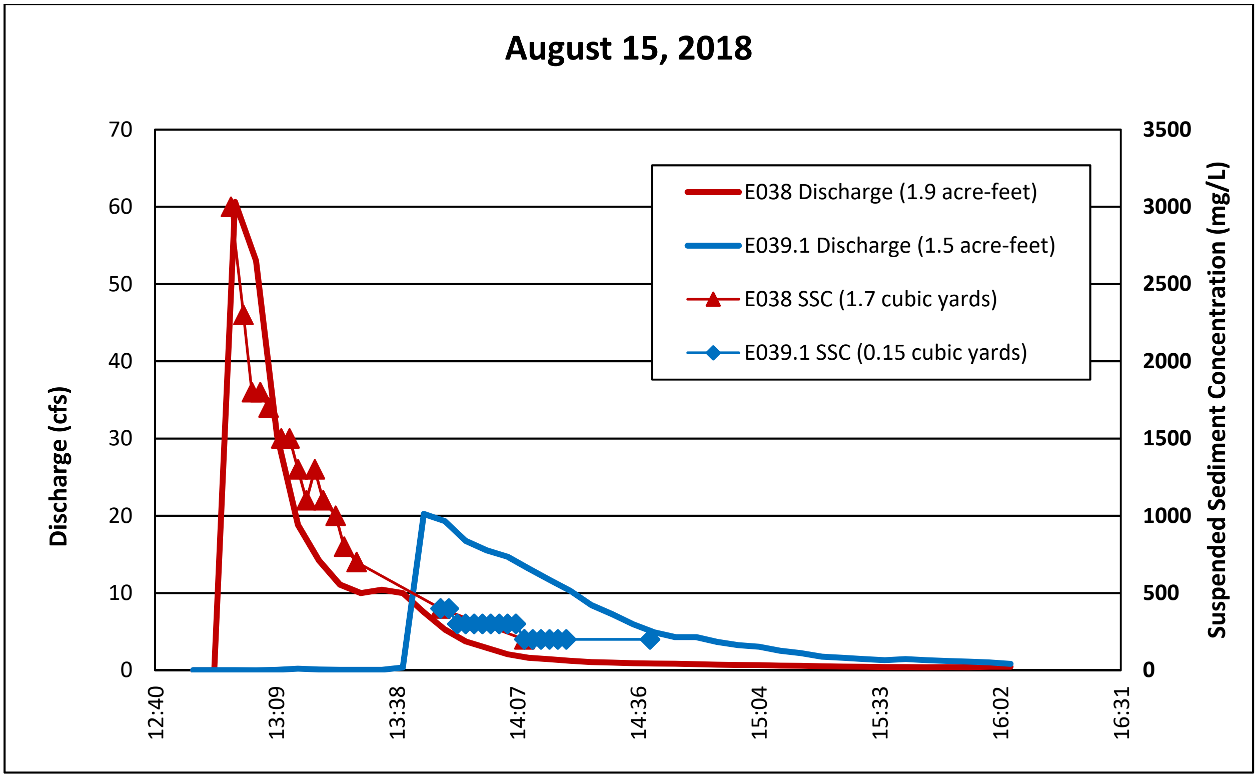


Figure 3.4-2 Discharge and SSC at E038 and E039.1 in upper Los Alamos Canyon on days when sampling of the same runoff event occurred



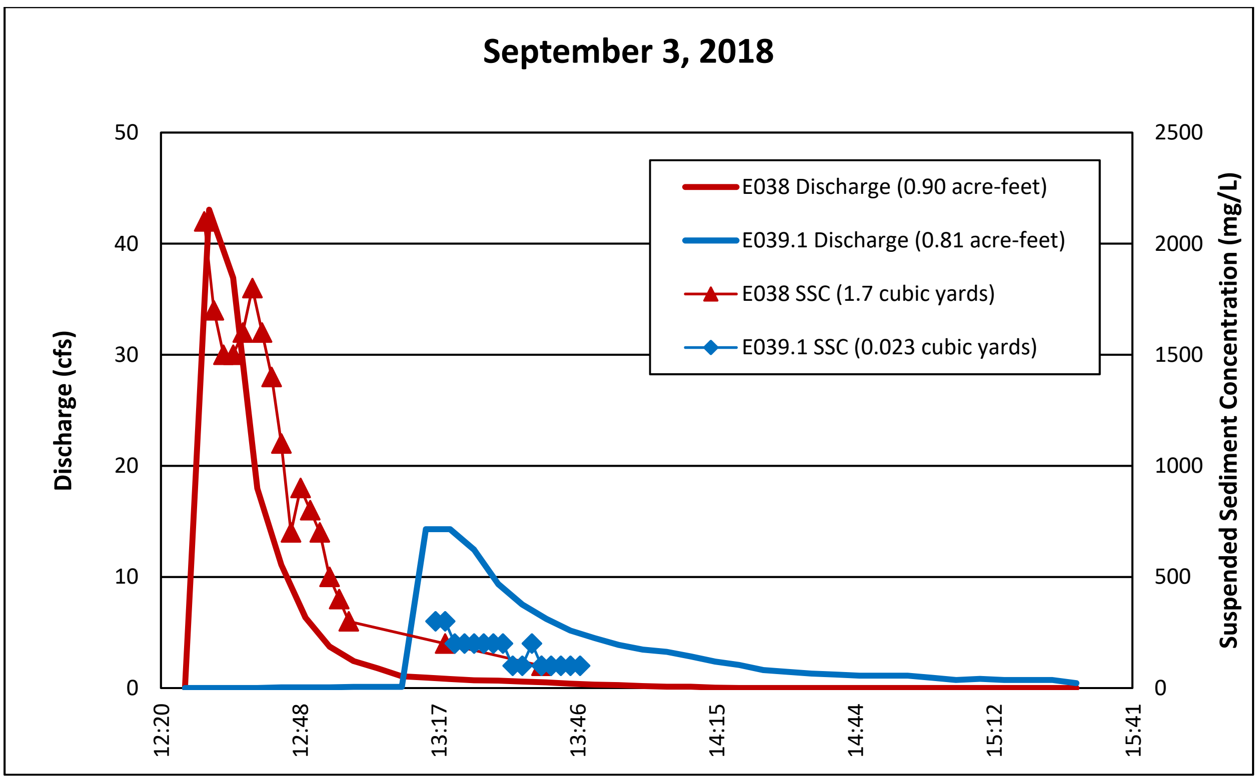


Figure 3.4-2 (continued) **Discharge and SSC at E038 and E039.1 in upper Los Alamos Canyon on days when sampling of the same runoff event occurred**

Table 2.1-1
Equipment Configuration at LA/P Gaging Stations

Gaging Station	Stage Measurement Sensor	Communication Method with Data Logger	Sampler Trip Level (Discharge) (cfs)	Dates Sampler Trip Level Active
E026	Radar Sensor	Radio telemetry	10	Monitoring season
E030	Radar Sensor	Radio telemetry	10	Monitoring season
E038	Radar Sensor	Radio telemetry	40	5/31/2018–9/5/2018
E038	Radar Sensor	Radio telemetry	90	9/5/2018–11/7/2018
E039.1	Radar Sensor	Radio telemetry	10	5/31/2018–9/5/2018
E039.1	Radar Sensor	Radio telemetry	76	9/5/2018–11/9/2018
E040	Radar Sensor	Radio telemetry	10	Monitoring season
E042.1	Encoder, bubbler, probe	Radio telemetry	10	Monitoring season
E050.1	Encoder, bubbler, radar sensor	Radio telemetry	5	Monitoring season
E055	Bubbler	Radio telemetry	10	Monitoring season
E055.5	Radar sensor	Radio telemetry	As close to 10 cfs as possible*	Monitoring season
E056	Bubbler	Radio telemetry	10	7/11/2018-9/6/2018
E056	Bubbler	Radio telemetry	19	9/6/2018-11/6/2018
E059.5	Bubbler	Radio telemetry	10	Monitoring season
E059.8	Bubbler	Radio telemetry	10	Monitoring season
E060.1	Encoder, bubbler, radar sensor	Radio telemetry	5	Monitoring season
E026	Radar Sensor	Radio telemetry	10	Monitoring season
E030	Radar Sensor	Radio telemetry	10	Monitoring season
E038	Radar Sensor	Radio telemetry	40	5/31/2018–9/5/2018
E038	Radar Sensor	Radio telemetry	90	9/5/2018–11/7/2018
E039.1	Radar Sensor	Radio telemetry	10	5/31/2018–9/5/2018
E039.1	Radar Sensor	Radio telemetry	76	9/5/2018–11/9/2018
E040	Radar Sensor	Radio telemetry	10	Monitoring season
E042.1	Encoder, bubbler, probe	Radio telemetry	10	Monitoring season
E050.1	Encoder, bubbler, radar sensor	Radio telemetry	5	Monitoring season
E055	Bubbler	Radio telemetry	10	Monitoring season
E055.5	Radar sensor	Radio telemetry	As close to 10 cfs as possible*	Monitoring season
E056	Bubbler	Radio telemetry	10	7/11/2018–9/6/2018
E056	Bubbler	Radio telemetry	19	9/6/2018–11/6/2018
E059.5	Bubbler	Radio telemetry	10	Monitoring season
E059.8	Bubbler	Radio telemetry	10	Monitoring season
E060.1	Encoder, bubbler, radar sensor	Radio telemetry	5	Monitoring season

* Log check dams installed downstream of E055.5 caused the channel bed to fluctuate significantly throughout 2017; therefore, the water depth (ft) is presented for E055.5 instead of discharge. The location of the stage sensor was moved upstream to a more stable location in March 2018. The gaging station will be surveyed in 2019.

Table 2.3-1
Maximum Daily Discharge and Storm Water Sampling in the LA/P Watershed during 2018

Date	Los Alamos/Pueblo (cfs)											
	DP Canyon			Los Alamos Canyon				Acid Canyon		Pueblo Canyon		
	E038	E039.1	E040	E026	E030	E042.1	E050.1	E055.5[a]	E056	E055	E059.8	E060.1
7/13/2018	0.46 BT[b]	0 BT	0 BT	0.22 BT	0 BT	0 BT	0 BT	0.64	3.1 S[c]	0 BT	0 BT	0 BT
7/17/2018	16 BT	0.04 BT	0 BT	2.2 BT	0 BT	0 BT	0 BT	0.51	4.2 S	0 BT	0 BT	0 BT
8/2/2018	66 S	24 S	1.4 BT	0 BT	0 BT	0 BT	0 BT	0.92 S	0.02 BT	0 BT	0 BT	0 BT
8/9/2018	14 BT	6.0 BT	0 BT	0.29 BT	0 BT	0.07 BT	0 BT	0.45	4.6 S	14 S	0 BT	0 BT
8/10/2018	88 S	50 S	20 S	0 BT	0 BT	3.2 BT	2.3 BT	0.46	0.84 BT	0 BT	0 BT	1.1 BT
8/15/2018	64 S	20 S	8.7 BT	0 BT	0 BT	0 BT	0 BT	0.53	2 BT	0.33 BT	0 BT	0 BT
9/3/2018	46 S	14 S	0.11 BT	0.80 BT	0 BT	0 BT	0 BT	0.72 S	4.6 BT	5.9 BT	0 BT	0 BT
9/4/2018	115 NS[d]	75 S	78 S	0.70 BT	0 BT	10 S	0 BT	0.61	3.1 S	3.5 BT	0 BT	0 BT
9/5/2018	11 BT[e]	18 BT[e]	19 S	0.80 BT	0 BT	6.7 BT	0 BT	0.45	4.6 BT	7.6 BT	0 BT	0 BT
10/14/2018	67 BT	20 BT	4.5 BT	0 BT	0 BT	0 BT	0 BT	0.51	1.2 BT	0 BT	0 BT	0 BT
10/23/2018	42 BT	26 BT	19 S	0.01 BT	0 BT	0 BT	0 BT	0.53	1.6 BT	5.3 BT	0.08 BT	0 BT

[a] Log check dams installed downstream of E055.5 caused the channel bed to fluctuate significantly throughout 2018; therefore, the water depth (ft) is presented for E055.5 instead of discharge. The location of the stage sensor was moved upstream to a more stable location in March 2018. A rating curve to calculate discharge will be developed in 2019.

[b] BT = Below gage station triggering threshold, no sample collected.

[c] S = Sample was collected. These discharge levels (and stage for E055.5) are highlighted in yellow to emphasize those events for which discharge exceeded the trip level and samples were collected.

[d] NS = No sample was collected, but discharge was above gaging station trip level. These discharge levels are shaded in blue to highlight those events where discharge was above trip level, but no sample was collected. Sampler collected from storm on the previous day.

[e] The trip level was raised for the remainder of the season.

Table 2.3-2
Sampling Operational Issues during the 2018 Monitoring Year

Gaging Station	Date	Peak Discharge (cfs)	Reason	Comment
E026	n/a*	n/a	n/a	No sampling operational issues during 2018
E030	n/a	n/a	n/a	No sampling operational issues during 2018
E038	n/a	n/a	n/a	No sampling operational issues during 2018
E039.1	n/a	n/a	n/a	No sampling operational issues during 2018
E040	n/a	n/a	n/a	No sampling operational issues during 2018
E042.1	n/a	n/a	n/a	No sampling operational issues during 2018
E050.1	n/a	n/a	n/a	No sampling operational issues during 2018
E055	n/a	n/a	n/a	No sampling operational issues during 2018
E055.5	n/a	n/a	n/a	No sampling operational issues during 2018
E056	n/a	n/a	n/a	No sampling operational issues during 2018
E059.5	n/a	n/a	n/a	No sampling operational issues during 2018
E059.8	n/a	n/a	n/a	No sampling operational issues during 2018
E060.1	n/a	n/a	n/a	No sampling operational issues during 2018

* n/a = Not applicable.

Table 2.4-1
Factors Contributing to Analytical Suite Prioritization

Gage	Priority	Analytical Suite	Glass Bottle	Polyethylene Bottle	Minimum Volume Required (L)
DP Canyon Gages					
E038, E039.1, E040	1	PCBs[a], TOC[b], BLM Suite[c]	Yes	No	1
	2	Gamma spectroscopy[d]	Yes	Yes	1
	3	Isotopic radionuclides	Yes	Yes	1
	4	Dioxins and furans	Yes	No	1
	5	Strontium-90	No	Yes	1
	6	TAL metals[e] (F[f]/UF[g])	Yes	Yes	0.25/0.25
	7	Particle size	Yes	Yes	1
Upper Los Alamos Canyon Gages					
E026, E030	1	PCBs, TOC, BLM Suite	Yes	No	1
	2	Gamma spectroscopy	Yes	Yes	1
	3	Isotopic radionuclides	Yes	Yes	1
	4	Dioxins and furans	Yes	No	1
	5	Strontium-90	No	Yes	1
	6	TAL metals (F/UF)	Yes	Yes	0.25/0.25
	7	Particle size	Yes	Yes	1

Table 2.4-1 (continued)

Gage	Priority	Analytical Suite	Glass Bottle	Polyethylene Bottle	Minimum Volume Required (L)
Upper Pueblo Canyon and Acid Canyon Gages					
E055, E055.5, E056	1	PCBs, TOC, BLM Suite	Yes	No	1
	2	Isotopic radionuclides	Yes	Yes	1
	3	TAL metals (F/UF)	Yes	Yes	0.25/0.25
	4	Particle size	Yes	Yes	1
Lower Los Alamos Canyon Gages					
E042.1	1	PCBs, TOC, BLM Suite	Yes	No	1
	2	Gamma spectroscopy	Yes	Yes	1
	3	Isotopic radionuclides	Yes	Yes	1
	4	Dioxins/furans	Yes	No	1
	5	Strontium-90	Yes	Yes	1
	6	TAL Metals (F/UF)	Yes	Yes	0.25/0.25
	7	Gross alpha/Gross beta	Yes	Yes	0.25
	8	Radium-226/Radium-228	Yes	Yes	2
E050.1	1	PCBs, TOC, BLM Suite	Yes	No	1
	2	Gamma spectroscopy	Yes	Yes	1
	3	Isotopic radionuclides	Yes	Yes	1
	4	Dioxins/furans	Yes	No	1
	5	Strontium-90	Yes	Yes	1
	6	TAL Metals (F/UF)	Yes	Yes	0.25/0.25
	7	Gross alpha/Gross beta	Yes	Yes	0.25
	8	Radium-226/Radium-228	Yes	Yes	2
Lower Pueblo Canyon Gages					
E059.5, E059.8	1	PCBs, TOC, BLM Suite	Yes	No	1
	2	Gamma spectroscopy	Yes	Yes	1
	3	Isotopic radionuclides	Yes	Yes	1
	4	Dioxins/furans	Yes	No	1
	5	Strontium-90	Yes	Yes	1
	6	TAL Metals (F/UF)	Yes	Yes	0.25/0.25
	7	Gross alpha/Gross beta	Yes	Yes	0.25
	8	Radium-226/Radium-228	Yes	Yes	2

Table 2.4-1 (continued)

Gage	Priority	Analytical Suite	Glass Bottle	Polyethylene Bottle	Minimum Volume Required (L)
E060.1	1	PCBs, TOC, BLM Suite	Yes	No	1
	2	Gamma spectroscopy	Yes	Yes	1
	3	Isotopic radionuclides	Yes	Yes	1
	4	Dioxins/furans	Yes	No	1
	5	Strontium-90	Yes	Yes	1
	6	TAL Metals (F/UF)	Yes	Yes	0.25/0.25
	7	Gross alpha/Gross beta	Yes	Yes	0.25
	8	Radium-226/Radium-228	Yes	Yes	2
Detention Basin and Vegetative Buffer below the SWMU 01-001(f) Drainage					
CO111041, CO101038	1	PCBs, TOC, BLM Suite	Yes	No	1
	2	TAL Metals (F/UF)	Yes	Yes	0.25/0.25
	3	Gross alpha	Yes	Yes	1

[a] PCBs = Polychlorinated biphenyls.

[b] TOC = Total organic carbon.

[c] BLM Suite = Alkalinity, dissolved organic carbon, pH, and sulfate.

[d] Gamma spectroscopy = Actinium-228, Beryllium-7, Bismuth-212, Bismuth-214, Cesium-134, Cobalt-60, Gross gamma, Iodine-131, Lead-212, Lead-214, Potassium-40, Protactinium-234m, Sodium-22, Thallium-208, and Thorium-234.

[e] TAL Metals = TAL metals are Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, and Zn; hardness is calculated from calcium and magnesium, components of the TAL list.

[f] F = Analyses of filtered sample.

[g] UF = Analyses unfiltered sample.

Table 2.4-2
Analytical Requirements for Storm Water Samples

Analytical Suite	Method	BDD[a] Monitoring	Detention Basins and Wetland Below the SWMU 01-001(f) Drainage	DP Canyon Gages	Fire-affected Lower Watershed Gages	Lower Pueblo Canyon Gages	Upper Los Alamos Canyon	Upper Pueblo Canyon and Acid Canyon Gages
Alkalinity	EPA:310.1	~~X~~[b]	X[c]	X	X	X	X	X
Americium-241	HASL-300:AM-241	~~X~~	—[d]	—	X	X	—	X
Chloride	EPA:300.0	~~X~~	X	X	X	X	X	X
Dioxins/furans	EPA:1613B	~~X~~	—	—	X	X	X	—
Dissolved organic carbon	SW-846:9060	~~X~~	X	X	X	X	X	X
Gamma spectroscopy	EPA:901.1	~~X~~	—	X	X	X	X	X
Gross alpha	EPA:900	~~X~~	X	X	X	X	X	X
Gross beta	EPA:900	X	—	—	X	X	—	—
Hardness[e]	SM:A2340B	~~X~~	X	X	X	X	X	X
Isotopic plutonium	HASL-300:ISOPU	~~X~~	—	X	X	X	X	X
Isotopic uranium	HASL-300:ISOU	X	—	—	X	X	—	—
Mercury	EPA:245.2	—	X	X	X	X	X	X
Particle size	ASTM:C1070-01	~~X~~	X	X	X	X	X	X
PCBs	EPA:1668C	~~X~~	X	X	X	X	X	X
pH	EPA:150.1	~~X~~	X	X	X	X	X	X
Radium-226/Radium-228	EPA:903.1/904	X	—	—	X	X	—	—
Silver	EPA:200.8	—	—	—	—	X	—	X
SSC	ASTM:D3977-97	~~X~~	X	X	X	X	X	X
Strontium-90	EPA:905.0	~~X~~	—	X	X	X	X	—
Sulfate	EPA:300.0	~~X~~	X	X	X	X	X	X
SW-IP-Hg+Se+U	EPA:200.8	—	X	X	X	X	X	X
TAL Metals	EPA:200.7/200.8/245.2	~~X~~	X	X	X	X	X	X
Total organic carbon	SW-846:9060	~~X~~	X	X	X	X	X	X

[a] BDD = Buckman Direct Diversion gaging stations E050.1 and E060.1.

[b] Redline strikethrough text indicates errors in the “2018 Monitoring Plan for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project” (LANL 2018, 603015).

[c] X = Monitoring planned.

[d] — = Monitoring not planned.

[e] Hardness is calculated from filtered calcium and magnesium, components of the TAL list.

Table 2.4-3
Actual Sampling Events

Sampling Station	Analytical Suite(s)	Analytical Method	Field Prep Code	Count of Field Sample IDs Collected
E030	Dioxins/Furans	EPA:1613B	UF[a]	2
E030	Particle Size	ASTM:C1070-01	UF	2
E030	SSC	ASTM:D3977-97	UF	4
E030	Alkalinity and pH	EPA:150.1	UF	2
E030	Sulfate and Chloride	EPA:300.0	F[b]	2
E030	Alkalinity and pH	EPA:310.1	UF	2
E030	DOC[c]	SM:5310B	F	2
E030	TOC[d]	SM:5310B	UF	2
E030	TAL Metals plus Boron and Uranium	EPA:200.7	F	2
E030	TAL Metals plus Boron and Uranium	EPA:200.8	F	2
E030	Mercury, Selenium, and Uranium	EPA:200.8	UF	2
E030	TAL Metals plus Boron and Uranium	EPA:245.2	F	2
E030	Mercury, Selenium, and Uranium	EPA:245.2	UF	2
E030	TAL Metals plus Boron and Uranium	SM:A2340B	F	2
E030	PCB Congeners	EPA:1668C	UF	2
E030	Gamma Spectroscopy and Gross Alpha	EPA:900	UF	2
E030	Gamma Spectroscopy and Gross Alpha	EPA:901.1	UF	2
E030	Strontium-90	EPA:905.0	UF	2
E030	Plutonium-239/240	HASL-300:ISOPU	UF	2
E038	Particle Size	ASTM:C1070-01	UF	8
E038	SSC	ASTM:D3977-97	UF	142
E038	Alkalinity and pH	EPA:150.1	UF	8
E038	Sulfate and Chloride	EPA:300.0	F	8
E038	Alkalinity and pH	EPA:310.1	UF	8
E038	TOC	SM:5310B	UF	1
E038	DOC	SM:5310B	F	1
E038	DOC	SM:5310C	F	3
E038	TOC	SM:5310D	UF	2
E038	TOC	SW-846:9060	UF	4
E038	DOC	SW-846:9060	F	4
E038	TAL Metals plus Boron and Uranium	EPA:200.7	F	8
E038	Mercury, Selenium, and Uranium	EPA:200.8	UF	8
E038	TAL Metals plus Boron and Uranium	EPA:200.8	F	8
E038	Mercury, Selenium, and Uranium	EPA:245.2	UF	8

Table 2.4-3 (continued)

Sampling Station	Analytical Suite(s)	Analytical Method	Field Prep Code	Count of Field Sample IDs Collected
E038	TAL Metals plus Boron and Uranium	EPA:245.2	F	8
E038	TAL Metals plus Boron and Uranium	SM:A2340B	F	8
E038	PCB Congeners	EPA:1668C	UF	8
E038	Gamma Spectroscopy and Gross Alpha	EPA:900	UF	8
E038	Gamma Spectroscopy and Gross Alpha	EPA:901.1	UF	8
E038	Strontium-90	EPA:905.0	UF	8
E038	Plutonium-239/240	HASL-300:ISOPU	UF	8
E039.1	Particle Size	ASTM:C1070-01	UF	9
E039.1	SSC	ASTM:D3977-97	UF	180
E039.1	Alkalinity and pH	EPA:150.1	UF	9
E039.1	Sulfate and Chloride	EPA:300.0	F	9
E039.1	Alkalinity and pH	EPA:310.1	UF	9
E039.1	TOC	SM:5310B	UF	1
E039.1	DOC	SM:5310B	F	1
E039.1	DOC	SM:5310C	F	3
E039.1	TOC	SM:5310D	UF	2
E039.1	DOC	SW-846:9060	F	5
E039.1	TOC	SW-846:9060	UF	5
E039.1	TAL Metals plus Boron and Uranium	EPA:200.7	F	9
E039.1	Mercury, Selenium, and Uranium	EPA:200.8	UF	9
E039.1	TAL Metals plus Boron and Uranium	EPA:200.8	F	9
E039.1	Mercury, Selenium, and Uranium	EPA:245.2	UF	9
E039.1	TAL Metals plus Boron and Uranium	EPA:245.2	F	9
E039.1	TAL Metals plus Boron and Uranium	SM:A2340B	F	9
E039.1	PCB Congeners	EPA:1668C	UF	9
E039.1	Gamma Spectroscopy and Gross Alpha	EPA:900	UF	9
E039.1	Gamma Spectroscopy and Gross Alpha	EPA:901.1	UF	9
E039.1	Strontium-90	EPA:905.0	UF	9
E039.1	Plutonium-239/240	HASL-300:ISOPU	UF	9
E040	Particle Size	ASTM:C1070-01	UF	8
E040	SSC	ASTM:D3977-97	UF	16
E040	Alkalinity and pH	EPA:150.1	UF	8
E040	Sulfate and Chloride	EPA:300.0	F	8
E040	Alkalinity and pH	EPA:310.1	UF	8
E040	TOC	SM:5310B	UF	2
E040	DOC	SM:5310B	F	2
E040	DOC	SM:5310C	F	2
E040	TOC	SM:5310D	UF	2

Table 2.4-3 (continued)

Sampling Station	Analytical Suite(s)	Analytical Method	Field Prep Code	Count of Field Sample IDs Collected
E040	TOC	SW-846:9060	UF	4
E040	DOC	SW-846:9060	F	4
E040	TAL Metals plus Boron and Uranium	EPA:200.7	F	8
E040	TAL Metals plus Boron and Uranium	EPA:200.8	F	8
E040	Mercury, Selenium, and Uranium	EPA:200.8	UF	8
E040	Mercury, Selenium, and Uranium	EPA:245.2	UF	8
E040	TAL Metals plus Boron and Uranium	EPA:245.2	F	8
E040	TAL Metals plus Boron and Uranium	SM:A2340B	F	8
E040	PCB Congeners	EPA:1668C	UF	8
E040	Gamma Spectroscopy and Gross Alpha	EPA:900	UF	8
E040	Gamma Spectroscopy and Gross Alpha	EPA:901.1	UF	8
E040	Strontium-90	EPA:905.0	UF	8
E040	Plutonium-239/240	HASL-300:ISOPU	UF	8
E042.1	Dioxins/Furans	EPA:1613B	UF	4
E042.1	Dioxins/Furans	EPA:1613B	UF	1
E042.1	Particle Size	ASTM:C1070-01	UF	5
E042.1	SSC	ASTM:D3977-97	UF	115
E042.1	Alkalinity and pH	EPA:150.1	UF	5
E042.1	Sulfate and Chloride	EPA:300.0	F	5
E042.1	Alkalinity and pH	EPA:310.1	UF	5
E042.1	DOC	SM:5310B	F	3
E042.1	TOC	SM:5310B	UF	3
E042.1	DOC	SM:5310C	F	1
E042.1	TOC	SM:5310D	UF	1
E042.1	DOC	SW-846:9060	F	1
E042.1	TOC	SW-846:9060	UF	1
E042.1	TAL Metals plus Boron and Uranium	EPA:200.7	F	5
E042.1	TAL Metals plus Boron and Uranium	EPA:200.8	F	5
E042.1	Mercury, Selenium, and Uranium	EPA:200.8	UF	5
E042.1	TAL Metals plus Boron and Uranium	EPA:245.2	F	5
E042.1	Mercury, Selenium, and Uranium	EPA:245.2	UF	5
E042.1	TAL Metals plus Boron and Uranium	SM:A2340B	F	5
E042.1	PCB Congeners	EPA:1668C	UF	10
E042.1	Gamma Spectroscopy and Gross Alpha	EPA:900	UF	5
E042.1	Gamma Spectroscopy and Gross Alpha	EPA:901.1	UF	5
E042.1	Strontium-90	EPA:905.0	UF	5
E042.1	Americium-241 and Plutonium-239/240	HASL-300:AM-241	UF	5
E042.1	Plutonium-239/240	HASL-300:ISOPU	UF	10

Table 2.4-3 (continued)

Sampling Station	Analytical Suite(s)	Analytical Method	Field Prep Code	Count of Field Sample IDs Collected
E050.1	Dioxins/Furans	EPA:1613B	UF	3
E050.1	Particle Size	ASTM:C1070-01	UF	3
E050.1	SSC	ASTM:D3977-97	UF	52
E050.1	Alkalinity and pH	EPA:150.1	UF	3
E050.1	Sulfate and Chloride	EPA:300.0	F	3
E050.1	Alkalinity and pH	EPA:310.1	UF	3
E050.1	SSC	SM:2540D	UF	1
E050.1	TOC	SM:5310B	UF	3
E050.1	DOC	SM:5310B	F	3
E050.1	TAL Metals plus Boron and Uranium	EPA:200.7		3
E050.1	TAL Metals plus Boron and Uranium	EPA:200.7	UF	3
E050.1	TAL Metals plus Boron and Uranium	EPA:200.7	F	6
E050.1	TAL Metals plus Boron and Uranium	EPA:200.8		3
E050.1	TAL Metals plus Boron and Uranium	EPA:200.8	F	6
E050.1	TAL Metals plus Boron and Uranium	EPA:200.8	UF	3
E050.1	TAL Metals plus Boron and Uranium	EPA:245.2		3
E050.1	TAL Metals plus Boron and Uranium	EPA:245.2	UF	3
E050.1	TAL Metals plus Boron and Uranium	EPA:245.2	F	6
E050.1	TAL Metals plus Boron and Uranium	SM:A2340B	UF	3
E050.1	TAL Metals plus Boron and Uranium	SM:A2340B		3
E050.1	TAL Metals plus Boron and Uranium	SM:A2340B	F	6
E050.1	PCB Congeners	EPA:1668C	UF	6
E050.1	Gamma Spectroscopy and Gross Alpha	EPA:900	UF	3
E050.1	Gross Beta	EPA:900	UF	3
E050.1	Gamma Spectroscopy and Gross Alpha	EPA:901.1	UF	3
E050.1	Radium-226/228	EPA:903.1	UF	3
E050.1	Radium-226/228	EPA:904	UF	3
E050.1	Strontium-90	EPA:905.0	UF	3
E050.1	Radium-226/228	Generic:Radium by Calculation	UF	3
E050.1	Plutonium-239/240 Uranium-235/236/238, Americium-241	HASL-300:AM-241	UF	3
E050.1	Plutonium-239/240	HASL-300:ISOPU	UF	6
E050.1	Plutonium-239/240 Uranium-235/236/238, Americium-241	HASL-300:ISOU	UF	3
E055	Particle Size	ASTM:C1070-01	UF	3
E055	SSC	ASTM:D3977-97	UF	6
E055	Alkalinity and pH	EPA:150.1	UF	3
E055	Sulfate and Chloride	EPA:300.0	F	3

Table 2.4-3 (continued)

Sampling Station	Analytical Suite(s)	Analytical Method	Field Prep Code	Count of Field Sample IDs Collected
E055	Alkalinity and pH	EPA:310.1	UF	3
E055	DOC	SM:5310B	F	2
E055	TOC	SM:5310B	UF	2
E055	TOC	SW-846:9060	UF	1
E055	DOC	SW-846:9060	F	1
E055	TAL Metals plus Boron and Uranium	EPA:200.7	F	3
E055	Silver	EPA:200.8	UF	3
E055	Mercury, Selenium, and Uranium	EPA:200.8	UF	3
E055	TAL Metals plus Boron and Uranium	EPA:200.8	F	3
E055	TAL Metals plus Boron and Uranium	EPA:245.2	F	3
E055	Mercury, Selenium, and Uranium	EPA:245.2	UF	3
E055	TAL Metals plus Boron and Uranium	SM:A2340B	F	3
E055	PCB Congeners	EPA:1668C	UF	3
E055	Gamma Spectroscopy and Gross Alpha	EPA:900	UF	3
E055	Gamma Spectroscopy and Gross Alpha	EPA:901.1	UF	3
E055	Americium-241 and Plutonium-239/240	HASL-300:AM-241	UF	3
E055	Plutonium-239/240	HASL-300:ISOPU	UF	3
E055.5	Particle Size	ASTM:C1070-01	UF	5
E055.5	SSC	ASTM:D3977-97	UF	10
E055.5	Alkalinity and pH	EPA:150.1	UF	5
E055.5	Sulfate and Chloride	EPA:300.0	F	4
E055.5	Sulfate and Chloride	EPA:300.0	UF	1
E055.5	Alkalinity and pH	EPA:310.1	UF	5
E055.5	DOC	SM:5310C	F	3
E055.5	TOC	SM:5310D	UF	3
E055.5	DOC	SW-846:9060	F	2
E055.5	TOC	SW-846:9060	UF	2
E055.5	TAL Metals plus Boron and Uranium	EPA:200.7	F	5
E055.5	TAL Metals plus Boron and Uranium	EPA:200.8	F	5
E055.5	Silver	EPA:200.8	UF	5
E055.5	Mercury, Selenium, and Uranium	EPA:200.8	UF	5
E055.5	Mercury, Selenium, and Uranium	EPA:245.2	UF	5
E055.5	TAL Metals plus Boron and Uranium	EPA:245.2	F	5
E055.5	TAL Metals plus Boron and Uranium	SM:A2340B	F	5
E055.5	PCB Congeners	EPA:1668C	UF	5
E055.5	Gamma Spectroscopy and Gross Alpha	EPA:900	UF	5
E055.5	Gamma Spectroscopy and Gross Alpha	EPA:901.1	UF	5
E055.5	Americium-241 and Plutonium-239/240	HASL-300:AM-241	UF	5

Table 2.4-3 (continued)

Sampling Station	Analytical Suite(s)	Analytical Method	Field Prep Code	Count of Field Sample IDs Collected
E055.5	Plutonium-239/240	HASL-300:ISOPU	UF	5
E056	Particle Size	ASTM:C1070-01	UF	8
E056	SSC	ASTM:D3977-97	UF	16
E056	Alkalinity and pH	EPA:150.1	UF	8
E056	Sulfate and Chloride	EPA:300.0	F	8
E056	Alkalinity and pH	EPA:310.1	UF	8
E056	TOC	SM:5310B	UF	1
E056	DOC	SM:5310C	F	3
E056	TOC	SM:5310D	UF	3
E056	TOC	SW-846:9060	UF	4
E056	DOC	SW-846:9060	F	5
E056	TAL Metals plus Boron and Uranium	EPA:200.7	F	8
E056	Silver	EPA:200.8	UF	8
E056	Mercury, Selenium, and Uranium	EPA:200.8	UF	8
E056	TAL Metals plus Boron and Uranium	EPA:200.8	F	8
E056	Mercury, Selenium, and Uranium	EPA:245.2	UF	8
E056	TAL Metals plus Boron and Uranium	EPA:245.2	F	8
E056	TAL Metals plus Boron and Uranium	SM:A2340B	F	8
E056	PCB Congeners	EPA:1668C	UF	8
E056	Gamma Spectroscopy and Gross Alpha	EPA:900	UF	8
E056	Gamma Spectroscopy and Gross Alpha	EPA:901.1	UF	8
E056	Americium-241 and Plutonium-239/240	HASL-300:AM-241	UF	8
E056	Plutonium-239/240	HASL-300:ISOPU	UF	8
E059.5	Particle Size	ASTM:C1070-01	UF	1
E059.5	SSC	ASTM:D3977-97	UF	21
E059.5	Alkalinity and pH	EPA:150.1	UF	1
E059.5	Sulfate and Chloride	EPA:300.0	F	1
E059.5	Alkalinity and pH	EPA:310.1	UF	1
E059.5	DOC	SM:5310B	F	1
E059.5	TOC	SM:5310B	UF	1
E059.5	TAL Metals plus Boron and Uranium	EPA:200.7	F	1
E059.5	Mercury, Selenium, and Uranium	EPA:200.8	UF	1
E059.5	TAL Metals plus Boron and Uranium	EPA:200.8	F	1
E059.5	Silver	EPA:200.8	UF	1
E059.5	Mercury, Selenium, and Uranium	EPA:245.2	UF	1
E059.5	TAL Metals plus Boron and Uranium	EPA:245.2	F	1
E059.5	TAL Metals plus Boron and Uranium	SM:A2340B	F	1
E059.5	PCB Congeners	EPA:1668C	UF	2

Table 2.4-3 (continued)

Sampling Station	Analytical Suite(s)	Analytical Method	Field Prep Code	Count of Field Sample IDs Collected
E059.5	Gamma Spectroscopy and Gross Alpha	EPA:900	UF	1
E059.5	Gamma Spectroscopy and Gross Alpha	EPA:901.1	UF	1
E059.5	Strontium-90	EPA:905.0	UF	1
E059.5	Americium-241 and Plutonium-239/240	HASL-300:AM-241	UF	1
E059.5	Plutonium-239/240	HASL-300:ISOPU	UF	2
E059.8	Particle Size	ASTM:C1070-01	UF	2
E059.8	SSC	ASTM:D3977-97	UF	28
E059.8	Alkalinity and pH	EPA:150.1	UF	2
E059.8	Sulfate and Chloride	EPA:300.0	F	2
E059.8	Alkalinity and pH	EPA:310.1	UF	2
E059.8	TOC	SM:5310B	UF	2
E059.8	DOC	SM:5310B	F	2
E059.8	TAL Metals plus Boron and Uranium	EPA:200.7	F	2
E059.8	Silver	EPA:200.8	UF	1
E059.8	TAL Metals plus Boron and Uranium	EPA:200.8	F	2
E059.8	Mercury, Selenium, and Uranium	EPA:200.8	UF	2
E059.8	TAL Metals plus Boron and Uranium	EPA:245.2	F	2
E059.8	Mercury, Selenium, and Uranium	EPA:245.2	UF	2
E059.8	TAL Metals plus Boron and Uranium	SM:A2340B	F	2
E059.8	PCB Congeners	EPA:1668C	UF	4
E059.8	Gamma Spectroscopy and Gross Alpha	EPA:900	UF	2
E059.8	Gamma Spectroscopy and Gross Alpha	EPA:901.1	UF	2
E059.8	Strontium-90	EPA:905.0	UF	2
E059.8	Americium-241 and Plutonium-239/240	HASL-300:AM-241	UF	2
E059.8	Plutonium-239/240	HASL-300:ISOPU	UF	4
LA-2	Particle Size	ASTM:C1070-01	UF	2
LA-2	SSC	ASTM:D3977-97	UF	4
LA-2	Alkalinity and pH	EPA:150.1	UF	2
LA-2	Sulfate and Chloride	EPA:300.0	F	2
LA-2	Alkalinity and pH	EPA:310.1	UF	2
LA-2	DOC	SM:5310C	F	1
LA-2	TOC	SM:5310D	UF	1
LA-2	DOC	SW-846:9060	F	1
LA-2	TOC	SW-846:9060	UF	1
LA-2	TAL Metals plus Boron and Uranium	EPA:200.7	F	2
LA-2	Mercury, Selenium, and Uranium	EPA:200.8	UF	2
LA-2	TAL Metals plus Boron and Uranium	EPA:200.8	F	2
LA-2	Mercury, Selenium, and Uranium	EPA:245.2	UF	2

Table 2.4-3 (continued)

Sampling Station	Analytical Suite(s)	Analytical Method	Field Prep Code	Count of Field Sample IDs Collected
LA-2	TAL Metals plus Boron and Uranium	EPA:245.2	F	2
LA-2	TAL Metals plus Boron and Uranium	SM:A2340B	F	2
LA-2	PCB Congeners	EPA:1668C	UF	2
LA-2	Gross Alpha	EPA:900	UF	2

[a] UF = Unfiltered.

[b] F = Filtered.

[c] DOC = Dissolved Organic Carbon.

[d] TOC = Total Organic Carbon.

[e] TAL = TAL metals are Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, and Zn; hardness is calculated from calcium and magnesium, components of the TAL list.

Table 2.5-1
Sample Collection and Sample Retrieval Working-Day Interval

Location Alias	Count of Sampled Storm Events	Count Retrieved on First Working Day	Count Retrieved after First Working Day	Comment
E056	4	3	1	1 working day between sample collection on 07/13/2018 and sample retrieval on 07/16/2018. 1 working day between sample collection on 07/17/2018 and sample retrieval on 07/18/2018. 1 working day between sample collection on 08/09/2018 and sample retrieval on 08/10/2018. 2 working days between sample collection on 09/04/2018 and sample retrieval on 09/06/2018.
CO111041	1	1	0	1 working day between sample collection on 07/13/2018 and sample retrieval on 07/16/2018.
E040	4	4	0	1 working day between sample collection on 08/10/2018 and sample retrieval on 08/13/2018. 1 working day between sample collection on 09/04/2018 and sample retrieval on 09/05/2018. 1 working day between sample collection on 09/05/2018 and sample retrieval on 09/06/2018. 1 working day between sample collection on 10/23/2018 and sample retrieval on 10/24/2018.
E038	4	3	1	1 working day between sample collection on 08/02/2018 and sample retrieval on 08/03/2018. 1 working day between sample collection on 08/10/2018 and sample retrieval on 08/13/2018. 1 working day between sample collection on 08/15/2018 and sample retrieval on 08/16/2018. 2 working days between sample collection on 09/03/2018 and sample retrieval on 09/05/2018.

Table 2.5-1 (continued)

Location Alias	Count of Sampled Storm Events	Count Retrieved on First Working Day	Count Retrieved after First Working Day	Comment
E039.1	5	5	0	1 working day between sample collection on 08/02/2018 and sample retrieval on 08/03/2018. 1 working day between sample collection on 08/10/2018 and sample retrieval on 08/13/2018. 1 working day between sample collection on 08/15/2018 and sample retrieval on 08/16/2018. 1 working day between sample collection on 09/03/2018 and sample retrieval on 09/04/2018. 1 working day between sample collection on 09/04/2018 and sample retrieval on 09/05/2018.
E042.1	1	1	0	1 working day between sample collection on 09/04/2018 and sample retrieval on 09/05/2018.
E055	1	1	0	1 working day between sample collection on 08/09/2018 and sample retrieval on 08/10/2018.
E055.5	2	2	0	1 working day between sample collection on 08/02/2018 and sample retrieval on 08/03/2018. 1 working day between sample collection on 09/03/2018 and sample retrieval on 09/04/2018.

Table 2.5-2
Gaging Station Operational Issues during the 2018 Monitoring Year

Gaging Station	Reason	Issue Date	Repair Date	Working Days from Issue to Repair	Potential Missed Discharge above Trigger	Peak Discharge (cfs)
E038	Silting	6/17/2018	6/22/2018	5	0	<1
	Silting	7/15/2018	7/20/2018	5	0	15
	Silting	7/31/2018	8/2/2018	2	0	<1
	Silting	8/2/2018	8/3/2018	1	0	5.5
	Silting	8/3/2018	8/10/2018	5	0	14
	Silting	8/10/2018	8/13/2018	1	0	<1
	Silting	8/15/2018	8/16/2018	1	0	<1
E040	Silting	8/10/2018	8/13/2018	1	0	<1
	Silting	8/15/2018	8/23/2018	6	0	<1
	Silting	9/4/2018	9/5/2018	1	0	1
	Silting	9/5/2018	9/6/2018	1	0	<1
	Silting	10/14/2018	10/16/2018	2	0	<1
	Silting	10/25/2018	10/30/2018	3	0	0
	Silting	10/31/2018	11/1/2018	1	0	<1
	Silting	11/5/2018	11/9/2018	4	0	<1

Table 2.5-3
Gaging Station and Sampler Inspection Interval

Inspection Date	CO101038	CO111041	E026	E030	E038	E039.1	E040	E042.1	E050.1	E055	E055.5	E056	E059.5	E059.8	E060.1	E099
1/4/2018	—[a]	—	—	—	—	—	—	—	Initial GI[b]	—	—	—	—	—	Initial GI	Initial GI
1/5/2018	—	—	Initial GI	—	Initial GI	—	Initial GI	—	—	—	—	—	—	—	—	—
1/9/2018	—	—	4 GI[c]	—	—	—	—	—	—	—	—	—	—	—	—	—
1/11/2018	—	—	—	—	—	—	—	—	7 GI	Initial GI	—	Initial GI	—	—	7 GI	7 GI
1/12/2018	—	—	—	—	—	—	—	—	—	—	—	—	Initial GI	Initial GI	—	—
1/17/2018	—	—	—	Initial GI	—	—	—	—	—	—	—	—	—	—	—	—
1/18/2018	—	—	—	—	—	Initial GI	—	Initial GI	—	—	Initial GI	—	—	—	—	7 GI-R[d]
1/19/2018	—	—	—	—	—	—	—	—	8 GI	—	—	—	—	—	8 GI	—
1/25/2018	—	—	—	—	—	—	—	—	6 GI	—	—	—	—	—	6 GI	7 GI
1/26/2018	—	—	—	—	—	—	—	—	—	—	—	—	14 GM[e]	—	—	—
2/1/2018	—	—	—	—	—	—	—	—	7 GI	—	—	—	—	—	7 GI	7 GI
2/2/2018	—	—	24 GI	—	28 GI	—	28 GI	—	—	—	—	—	—	—	—	—
2/5/2018	—	—	—	19 GI	—	—	—	—	—	—	—	—	—	—	—	—
2/8/2018	—	—	—	—	—	—	—	—	7 GI	—	—	—	13 GI	27 GI	7 GI	7 GI
2/9/2018	—	—	—	—	—	—	—	—	—	29 GI	—	29 GI	—	—	—	—
2/13/2018	—	—	—	—	11 GM	—	—	—	—	—	—	—	—	—	—	—
2/15/2018	—	—	—	—	—	28 GM	—	28 GI	7 GI	—	28 GI	—	—	—	7 GI	7 GI
2/22/2018	—	—	—	—	—	—	—	—	7 GM	—	—	—	—	—	7 GI	7 GI-R
3/1/2018	—	—	—	—	—	—	—	—	7 GI	—	—	—	—	—	7 GI	7 GI

Table 2.5-3 (continued)

Inspection Date	CO101038	CO111041	E026	E030	E038	E039.1	E040	E042.1	E050.1	E055	E055.5	E056	E059.5	E059.8	E060.1	E099
3/2/2018	—	—	28 GI	—	17 GI	—	28 GI	—	—	—	—	—	—	—	—	—
3/8/2018	—	—	—	31 GI	—	—	—	—	—	27 GI	—	27 GI	—	—	—	7 GI
3/9/2018	—	—	—	—	—	—	—	—	8 GI	—	—	—	29 GI	29 GI	8 GI	—
3/14/2018	—	—	—	—	—	—	—	27 GI	—	—	—	—	—	—	—	—
3/15/2018	—	—	—	—	—	28 GI	—	—	6 GI	—	—	—	—	—	6 GI	7 GI
3/16/2018	—	—	—	—	—	—	—	—	—	—	29 GI	—	—	—	—	—
3/22/2018	—	—	—	—	—	—	—	—	7 GI	—	6 GM	—	—	—	7 GI	7 GI
3/28/2018	—	—	26 GI	—	—	—	26 GI	—	—	—	—	—	—	—	—	—
3/29/2018	—	—	—	—	27 GI	—	—	—	7 GI	—	—	—	—	—	7 GI	7 GI
4/4/2018	—	—	—	—	—	—	—	—	—	—	13 GI	—	26 GI	26 GI	—	—
4/5/2018	—	—	—	28 GI	—	—	—	—	7 GI	28 GI	—	28 GI	—	—	7 GI	7 GI
4/12/2018	—	—	—	—	—	28 GI	—	29 GI	7 GI	—	—	—	—	—	7 GI	7 GI
4/16/2018	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4 GI
4/17/2018	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5 GI	—
4/18/2018	—	—	—	—	—	—	—	—	6 GI	—	—	—	—	—	—	—
4/19/2018	—	—	22 GI	14 GI	—	—	22 GI	7 GI	—	—	—	—	—	—	—	—
4/23/2018	—	—	—	—	25 GI	—	—	—	—	—	—	—	—	—	—	—
4/24/2018	—	—	—	—	—	—	—	—	6 GI	—	—	—	—	—	7 GI	8 GI
5/1/2018	—	—	—	—	—	—	—	—	7 GI-R	—	—	—	—	—	7 GI	7 GI
5/10/2018	—	—	—	21 GI	—	—	21 GI	21 GI	9 GI	—	—	—	—	—	—	—
5/11/2018	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	10 GI

Table 2.5-3 (continued)

Inspection Date	CO101038	CO111041	E026	E030	E038	E039.1	E040	E042.1	E050.1	E055	E055.5	E056	E059.5	E059.8	E060.1	E099
5/17/2018	—	—	—	—	—	—	—	—	7 GI	—	—	—	—	—	16 GI	6 GI
5/18/2018	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1 GI	—
5/22/2018	—	—	33 GI-R	—	29 GI-R	40 GI-R	—	—	—	47 GI-R	48 GI-R	47 GI-R	48 GI-R	48 GI-R	—	—
5/24/2018	—	—	—	—	—	—	—	—	7 GI	—	—	—	—	—	—	7 GI
5/25/2018	—	—	—	15 SA[f]	—	—	15 SA	15 SA	1 SA	—	—	—	3 GMSA[g]	—	7 GISA[h]	—
5/29/2018	—	—	7 SA	—	—	—	—	—	—	—	—	—	—	—	—	—
5/30/2018	Initial SA	Initial SA	—	—	—	—	—	—	5 GI	—	—	—	—	8 SA	5 GI	—
5/31/2018	—	—	—	—	9 SA	9 SA	—	—	—	—	—	—	—	—	—	7 GI
6/5/2018	—	—	6 GSI[i]	—	—	5 GSI	—	—	6 GSI	—	14 GI	—	—	—	6 GSI	—
6/7/2018	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7 GI
6/8/2018	9 SI[j]	9 SI	—	14 GI-R	8 GSI	—	14 GI-R	14 GSI	—	17 GI-R	—	17 GI-R	14 GSI	9 GSI	—	—
6/11/2018	—	—	6 GSI	—	—	—	—	—	—	—	—	—	—	—	—	—
6/12/2018	—	—	—	4 GI-R	—	—	4 GI-R	—	7 GSI	4 GI-R	—	4 GI-R	—	—	7 GSI	—
6/14/2018	—	—	—	—	6 GI	—	—	—	—	—	9 GI	—	—	—	—	—
6/15/2018	7 SI	7 SI	—	—	1 SI	10 GI-R	—	7 GSI	—	—	—	—	7 GSI	7 GSI	—	8 GI
6/18/2018	—	—	—	—	—	3 GSI	—	3 GSI	6 GSI	—	—	—	—	—	6 GSI	—
6/19/2018	—	—	—	7 GSI	—	—	7 GSI	—	—	—	—	—	—	—	—	—
6/20/2018	—	—	9 GSI	—	—	—	—	—	—	—	—	—	5 GSI	5 GSI	—	—
6/21/2018	6 SI	6 SI	—	—	—	—	—	—	—	—	7 GI	—	—	—	—	6 GI
6/22/2018	—	—	—	—	7 GSI	—	—	—	—	10 GI	—	10 GI	—	—	—	—
6/25/2018	—	—	—	6 GSI	—	—	6 GSI	7 GSI	7 GSI	—	—	—	—	—	7 GSI	—

Table 2.5-3 (continued)

Inspection Date	CO101038	CO111041	E026	E030	E038	E039.1	E040	E042.1	E050.1	E055	E055.5	E056	E059.5	E059.8	E060.1	E099
6/27/2018	6 SI	6 SI	7 GSI	—	—	9 GSI	—	—	—	—	—	—	—	—	—	—
6/28/2018	—	—	—	—	—	—	—	—	—	—	—	—	8 GSI	8 GSI	—	7 GI
6/29/2018	—	—	—	—	7 GSI	—	—	—	—	7 GI-R	8 GI	7 GI-R	—	—	4 SI	—
7/2/2018	—	—	—	7 GSI	—	—	7 GSI	7 GSI	7 GSI	—	—	—	—	—	—	—
7/3/2018	6 SI	6 SI	6 GSI	—	4 GSI	6 GSI	—	—	—	—	—	—	—	—	4 GSI	—
7/5/2018	—	—	—	—	—	—	—	—	—	6 GI-R	—	6 GI-R	7 GSI	7 GSI	—	7 GI
7/6/2018	—	—	—	—	—	—	—	—	—	—	7 GI	—	—	—	—	—
7/9/2018	6 SI	6 SI	6 GSI	—	—	—	—	—	7 GSI	—	—	—	—	—	6 GSI	—
7/10/2018	—	—	—	8 GSI	—	7 GSI	8 GSI	8 GSI	—	—	—	—	5 GSI	—	—	—
7/11/2018	—	—	—	—	—	—	—	—	—	6 GISA	5 GI	6 GISA	—	6 GSI	—	—
7/12/2018	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7 GI
7/13/2018	—	—	—	—	10 GSI	—	—	—	—	—	—	—	—	—	—	—
7/16/2018	—	7 SI	—	—	—	—	—	—	—	5 GSI	—	5 GSI	—	—	—	—
7/17/2018	—	—	—	—	—	—	—	—	8 GSI	—	6 GI	—	—	—	8 GSI	—
7/18/2018	9 SI	—	9 GSI	8 GSI	—	—	8 GSI	—	—	—	—	2 SI	—	—	—	—
7/19/2018	—	—	—	—	—	9 GSI	—	—	—	—	—	—	—	—	—	7 GI
7/20/2018	—	—	—	—	7 GSI	—	—	10 GSI	—	—	3 SA	—	10 GSI	9 GSI	—	—
7/23/2018	—	—	5 GSI	—	—	—	—	3 GSI	6 GSI	—	—	—	—	—	6 GSI	—
7/24/2018	6 SI	8 SI	—	6 GSI	—	—	6 GSI	—	—	—	—	—	—	—	—	—
7/25/2018	—	—	—	—	5 GSI	6 GSI	—	—	—	—	—	—	—	—	—	—
7/26/2018	—	—	—	—	—	—	—	—	—	—	—	—	6 GSI	6 GSI	—	7 GI

Table 2.5-3 (continued)

Inspection Date	CO101038	CO111041	E026	E030	E038	E039.1	E040	E042.1	E050.1	E055	E055.5	E056	E059.5	E059.8	E060.1	E099
7/27/2018	—	—	—	—	—	—	—	—	—	11 GSI	7 GSI	9 GSI	—	—	—	—
7/30/2018	—	—	—	—	—	5 GSI	—	7 GSI	—	—	—	—	—	—	—	—
7/31/2018	—	—	8 GSI	—	—	—	—	—	—	—	—	—	5 GSI	—	8 GSI	—
8/1/2018	8 SI	8 SI	—	8 GSI	—	—	—	—	—	—	—	—	—	—	—	—
8/2/2018	—	—	—	—	8 GSI	—	9 GSI	—	10 GSI	—	—	—	—	—	—	7 GI
8/3/2018	—	—	—	—	1 SI	4 SI	—	—	—	7 GI-R	7 GSI	7 GI-R	—	8 GSI	—	—
8/6/2018	—	—	—	—	—	—	—	7 GM	—	—	—	—	—	—	6 GM-GSI	—
8/7/2018	—	—	—	—	—	—	—	—	5 GSI	—	—	—	7 GSI	4 GSI	—	—
8/8/2018	—	—	—	7 GSI	—	—	6 GSI	2 GSI	—	—	—	—	—	—	—	—
8/9/2018	—	—	—	—	—	6 GSI	—	—	—	6 GSI	6 GSI	6 GSI	—	—	—	7 GI
8/10/2018	9 SI	9 SI	10 GSI	—	7 GSI	—	—	—	3 GM	1 SI	—	1 SI	—	—	—	—
8/13/2018	3 SI	3 SI	—	—	3 GSI	4 GSI	5 GSI	—	—	—	—	—	—	—	—	—
8/14/2018	—	—	4 GSI	—	—	—	—	—	—	—	5 GSI	—	7 GSI	7 GSI	—	—
8/15/2018	—	—	—	—	—	—	—	—	5 GSI	5 GSI	—	5 GSI	—	—	9 GSI	—
8/16/2018	—	—	—	—	3 SI	3 SI	—	—	—	—	—	—	—	—	—	7 GI
8/17/2018	—	—	—	9 GSI	—	—	—	9 GSI	—	—	—	—	—	—	—	—
8/20/2018	—	—	—	3 GSI	—	—	—	—	5 GSI	—	—	—	—	—	—	—
8/21/2018	8 SI	8 SI	7 GSI	—	—	—	—	4 GSI	—	—	—	—	—	—	—	—
8/22/2018	—	—	—	—	—	6 GSI	—	—	—	—	—	—	8 GSI	8 GSI	7 GSI	—
8/23/2018	—	—	—	—	7 GSI	—	10 GSI	—	—	—	—	—	—	—	—	7 GI
8/24/2018	—	—	—	—	—	—	—	—	—	9 GSI	10 GSI	9 GSI	—	—	—	—

Table 2.5-3 (continued)

Inspection Date	CO101038	CO111041	E026	E030	E038	E039.1	E040	E042.1	E050.1	E055	E055.5	E056	E059.5	E059.8	E060.1	E099
8/27/2018	6 SI	6 SI	6 GSI	7 GSI	—	—	4 GSI	—	—	—	—	—	—	—	—	—
8/28/2018	—	—	—	—	—	—	—	7 GSI	8 GSI	—	—	—	6 GSI	6 GSI	6 GSI	—
8/29/2018	—	—	—	—	6 GSI	7 GSI	—	—	—	—	—	—	—	—	—	—
8/30/2018	—	—	—	—	—	—	—	—	—	6 GSI	6 GSI	6 GSI	—	—	—	7 GI
9/4/2018	—	—	—	—	—	6 GSI	—	—	—	5 GSI	5 GSI	5 GSI	—	—	—	—
9/5/2018	—	—	—	—	7 GSI	1 GMSI	9 GSI	8 GSI	—	—	—	—	—	—	—	—
9/6/2018	10 SI	10 SI	—	—	—	—	1 SI	—	—	—	—	2 GMSI	—	—	—	7 GI
9/7/2018	—	—	11 GSI	11 GSI	—	—	—	—	10 GSI	—	—	—	10 GSI	10 GSI	10 GSI	—
9/10/2018	—	—	3 GSI	3 GSI	—	—	4 GSI	—	3 GSI	—	—	—	—	—	—	—
9/11/2018	5 SI	5 SI	—	—	—	6 GSI	—	6 GSI	—	—	—	—	—	—	—	—
9/13/2018	—	—	—	—	8 GSI	—	—	—	—	—	—	—	6 GSI	6 GSI	6 GSI	7 GI
9/14/2018	—	—	—	—	—	—	—	—	4 GM	10 GSI	10 GSI	8 GSI	—	—	—	—
9/17/2018	—	—	—	—	—	—	—	—	—	—	—	—	4 GSI	4 GSI	4 GSI	—
9/18/2018	—	—	—	8 GSI	—	—	—	7 GSI	4 GSI	—	—	—	—	—	—	—
9/19/2018	—	—	—	—	—	—	—	—	—	5 GSI	—	5 GSI	—	—	—	—
9/20/2018	9 SI	9 SI	10 GSI	—	7 GM	—	10 GSI	—	—	—	—	—	—	—	—	7 GI
9/21/2018	—	—	—	—	1 GSI	10 GSI	—	—	—	—	7 GSI	—	—	—	—	—
9/24/2018	—	—	4 GSI	—	—	—	—	—	—	—	—	—	7 GSI	7 GSI	7 GSI	—
9/25/2018	5 SI	5 SI	—	7 GSI	—	4 GSI	5 GSI	7 GSI	—	—	—	—	—	—	—	—
9/27/2018	—	—	—	—	—	—	—	—	—	8 GSI	—	8 GSI	—	—	—	7 GI
9/28/2018	—	—	—	—	7 GSI	—	—	—	10 GSI	—	7 GSI	—	—	—	—	—

Table 2.5-3 (continued)

Inspection Date	CO101038	CO111041	E026	E030	E038	E039.1	E040	E042.1	E050.1	E055	E055.5	E056	E059.5	E059.8	E060.1	E099
10/1/2018	—	—	—	—	—	—	—	—	3 GSI	—	—	—	7 GSI	—	7 GSI	—
10/2/2018	—	—	8 GSI	7 GSI	—	—	—	7 GSI	—	—	—	—	—	—	—	—
10/3/2018	8 SI	8 SI	—	—	—	8 GSI	8 GSI	—	—	—	—	—	—	9 GSI	—	—
10/4/2018	—	—	—	—	6 GSI	—	—	—	—	7 GSI	6 GSI	7 GSI	—	—	—	7 GI
10/10/2018	7 SI	7 SI	8 GSI	8 GSI	—	—	7 GSI	8 GSI	—	—	—	—	—	—	—	—
10/11/2018	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7 GI
10/12/2018	—	—	—	—	8 GSI	9 GSI	—	—	11 GSI	8 GSI	8 GSI	8 GSI	11 GSI	9 GSI	11 GSI	—
10/16/2018	6 SI	6 SI	6 GSI	6 GSI	—	—	6 GSI	6 GSI	4 GSI	—	—	—	4 GSI	4 GSI	4 GSI	—
10/17/2018	—	—	—	—	—	5 GSI	—	—	—	—	—	—	—	—	—	—
10/18/2018	—	—	—	—	6 GSI	—	—	—	—	6 GSI	6 GSI	6 GSI	—	—	—	7 GI-R
10/23/2018	7 SI	7 SI	7 GSI	7 GSI	—	—	7 GSI	7 GSI	7 GSI	—	—	—	—	—	—	—
10/24/2018	—	—	—	—	—	—	1 SI	—	—	—	—	—	—	—	—	—
10/25/2018	—	—	—	—	—	—	—	—	—	—	—	—	—	—	9 GSI	7 GI
10/26/2018	—	—	—	—	8 GSI	9 GSI	—	—	—	8 GSI	8 GSI	8 GSI	10 GSI	10 GSI	—	—
10/30/2018	7 SI	7 SI	7 GSI	7 GSI	—	—	6 GSI	7 GSI	7 GSI	—	—	—	4 GSI	4 GSI	5 GSI	—
10/31/2018	—	—	—	—	—	—	—	—	—	—	5 GSI	—	—	—	—	6 GI
11/1/2018	—	—	—	—	6 GSI	6 GSI	—	—	—	6 GSI	—	6 GSI	—	—	—	—
11/6/2018	—	—	—	—	—	—	—	—	—	5 SSD[k]	6 SSD	5 SSD	—	—	—	—
11/7/2018	—	—	8 SSD	—	6 SSD	—	—	—	—	—	—	—	—	—	—	—
11/8/2018	9 SSD	9 SSD	—	—	—	—	—	—	—	—	—	—	—	—	—	8 GI
11/9/2018	—	—	—	10 SSD	—	8 SSD	10 SSD	10 SSD	10 SSD	—	—	—	10 SSD	10 SSD	10 SSD	—

Table 2.5-3 (continued)

Inspection Date	CO101038	CO111041	E026	E030	E038	E039.1	E040	E042.1	E050.1	E055	E055.5	E056	E059.5	E059.8	E060.1	E099
11/15/2018	—	—	—	—	—	—	—	—	6 GI	—	—	—	—	—	6 GI	7 GI
11/16/2018	—	—	9 GM	—	—	—	—	—	—	—	—	—	—	—	—	—
11/20/2018	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5 GI
11/23/2018	—	—	—	—	—	—	—	—	8 GI-R	—	—	—	—	—	8 GI-R	—
11/28/2018	—	—	—	—	—	—	—	19 GM	—	—	—	—	—	—	—	—
11/29/2018	—	—	—	—	—	—	—	—	6 GI	—	—	—	—	—	6 GI	—
11/30/2018	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	10 GI-R
12/6/2018	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6 GI
12/7/2018	—	—	—	—	—	—	—	—	8 GI-R	—	—	—	—	—	8 GI-R	—
12/13/2018	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6 GI-R	7 GI
12/14/2018	—	—	—	—	—	—	—	—	7 GI	—	—	—	—	—	—	—
12/18/2018	—	—	32 GI	39 GI	—	39 GI	39 GI	20 GI	—	—	—	—	—	—	—	—

Table 2.5-3 (continued)

Inspection Date	CO101038	CO111041	E026	E030	E038	E039.1	E040	E042.1	E050.1	E055	E055.5	E056	E059.5	E059.8	E060.1	E099
12/19/2018	—	—	—	—	—	—	—	—	—	43 GI	—	43 GI	40 GI	40 GI	—	—
12/20/2018	—	—	—	—	—	—	—	—	6 GI	—	—	—	—	—	7 GI	7 GI
12/21/2018	—	—	—	—	44 GI	—	—	—	—	—	45 GI	—	—	—	—	—
12/27/2018	—	—	—	—	—	—	—	—	7 GI-R	—	—	—	—	—	7 GI-R	7 GI-R

Note: Gray shading denotes days in which gaging stations/samplers were not active.

[a] — = No inspection performed.

[b] Initial GI = Initial gage inspection for the year.

[c] GI = Gage inspection.

[d] GI-R = Gage inspection – rain event.

[e] GM = gage maintenance.

[f] SA = Sampler activation.

[g] GMSA = Gage maintenance and sampler activation.

[h] GISA = Gage inspection and sampler activation.

[i] GSI = Gage and sampler inspection.

[j] SI = Sampler inspection.

[k] SSD = Sampler shutdown.

Table 3.1-1
Drainage Area and Impervious Surface Percentage in the Los Alamos Canyon Watersheds

Canyon	Gaging Station	Drainage Area (acres)	Impervious Surface (%)
Acid	E055.5	53	26
Acid*	E056	237	22
Acid	Acid Canyon above E056	290	23
Pueblo	E055	2184	8.0
Pueblo	E059.5	2099	11
Pueblo	E059.8	407	4.4
Pueblo*	E060.1	330	3.8
Pueblo	Pueblo Canyon above E060.1	5310	9.5
DP	E038	125	32
DP*	E039.1	111	12
DP*	E040	130	4.0
DP	DP Canyon above E039.1	236	23
DP	DP Canyon above E040	366	16
LA	E026	4354	0.4
LA*	E030	1100	13
LA*	E042.1	605	0.6
LA*	E050.1	193	2.2
LA*	E109.9 (including Guaje Canyon)	27,000	1.2
LA	Los Alamos Canyon above E050.1	6250	2.7
LA	Los Alamos, Pueblo, and Guaje Canyons above E109.9	37,760	2.6
LA*	Los Alamos Canyon between E050.1, E060.1, and E109.9	5240	2.4
Guaje	E099	21,000	0.9

Notes: Drainage areas marked by an asterisk do not extend to head of watershed above gaging station. The drainage areas without an asterisk extend from the gaging station to the head of the watershed.

Table 3.2-1
Travel Time of Flood Bore, Peak Discharge, Increase or Decrease in Peak Discharge, and Percent Change in Peak Discharge from Upstream to Downstream Gaging Stations for 2018 Runoff Events Exceeding Sampling Triggers across the Watershed Mitigations

Date	Travel Time from E038 to E039.1 (min)	Peak Discharge (cfs)		+/−[a]	%[a]	Travel Time from E042.1 to E050.1 (min)	Peak Discharge (cfs)		+/−[a]	%[a]
		E038	E039.1				E042.1	E050.1		
7/13	—[b]	0.46	0	−	100	—	0	0	—	—
7/17	—	16	0	−	100	—	0	0	—	—
8/2	45	66	24	−	64	—	0	0	—	—
8/9	55	14	6	−	58	—	0.07	0	−	100
8/10	30	88	50	−	44	20	3	2	−	28
8/15	45	64	20	−	69	—	0	0	—	—
9/3	45	46	14	−	69	—	0	0	—	—
9/4	30	115	75	−	35	—	10	0	−	100
9/5	G[c]	11	18	+	42	—	7	0	−	100
10/14	60	67	20	−	70	—	0	0	—	—
10/23	35	42	26	−	39	—	0	0	—	—
Min	30	0.46	0	—	35	20	0	0	—	28
Mean	43	48	23	—	63	20	2	0.21	—	82
Max	60	115	75	—	100	20	10	2	—	100

Date	Travel Time from E059.5 to E059.8 (min)	Peak Discharge (cfs)		+/−[a]	%[a]	Travel Time from E059.8 to E060.1 (min)	Peak Discharge (cfs)		+/−[a]	%[a]
		E059.5	E059.8				E059.8	E060.1		
7/13	—	0	0	—	—	—	0	0	—	—
7/17	—	0	0	—	—	—	0	0	—	—
8/2	—	0.43	0	−	100	—	0	0	—	—
8/9	—	0.20	0	−	100	—	0	0	—	—
8/10	—	0	0	−	—	—	0	1	+	100
8/15	—	0	0	—	—	—	0	0	—	—
9/3	—	0	0	—	—	—	0	0	—	—
9/4	—	0.07	0	−	100	—	0	0	—	—
9/5	—	0.27	0	−	100	—	0	0	—	—
10/14	—	0.27	0	—	100	—	0	0	—	—
10/23	—	0.40	0.08	−	80	—	0	0	—	—
Min	—	0	0	—	80	—	0	0	—	100
Mean	—	0.15	0.01	—	96	—	0	0	—	100
Max	—	0.43	0.08	—	100	—	0	1	—	100

[a] + = Increase; − = decrease; % = percent change in peak discharge.

[b] — = Result not applicable.

[c] G = Negative travel time (i.e., peak of downstream gaging station occurred before peak of upstream gaging station).

Table 3.2-2
Pearson's Correlation Coefficients Between Post-Flood Bore Discharge (Q) and SSC for Each Gaging Station Sampled during 2018

Time Lag	E038				E039.1					E042.1
	8/2	8/10	8/15	9/3	8/2	8/10	8/15	9/3	9/4	9/4
Q_t, SSC_t	0.92	0.98	0.88	0.86	0.96	0.93	0.84	0.86	0.90	0.90
Q_t, SSC_{t-2}	0.95	0.97	0.94	0.84	0.92	0.97	0.83	0.86	0.91	0.89
Q_t, SSC_{t-4}	0.95	0.97	0.96	0.83	0.93	0.98	0.82	0.85	0.89	0.87
Q_t, SSC_{t-6}	0.96	0.97	0.98	0.83	0.94	0.98	0.80	0.85	0.87	0.85
Q_t, SSC_{t-8}	0.97	0.97	0.98	0.84	0.94	0.98	0.80	0.83	0.86	0.84
Q_t, SSC_{t-10}	0.97	0.96	0.93	0.84	0.93	0.97	0.80	0.81	0.85	0.85
Q_t, SSC_{t-12}	0.96	0.95	0.89	0.81	0.90	0.97	0.82	0.88	0.85	0.29

Note: First maximum correlations are shaded in gray.

Table 3.2-3
SSC-Based Sediment Yield and Runoff Volume for Sampled 2013 to 2018 Runoff Events

Gaging Station	Date	Sediment Yield (tons)	Sediment Yield (yd^3)[a]	Runoff Volume (acre-ft)	Peak Discharge (cfs)
2013 Runoff Events					
E038	6/14/2013	11	5.1	3.0	70
E038	6/30/2013	11	5.0	1.9	120
E038	7/12/2013	87	39	14	330
E038	7/28/2013	4.7	2.1	1.6	74
E038	8/5/2013	25	11	5.1	170
E038	8/9/2013	3.8	1.7	1.3	62
E039.1	6/14/2013	0.6	0.3	1.3	13
E039.1	6/30/2013	0.3	0.1	0.8	11
E039.1	7/12/2013	75	34	16	330
E039.1	7/28/2013	0.8	0.4	1.2	24
E039.1	8/4/2013	0.8	0.4	0.7	12
E039.1	8/9/2013	0.5	0.2	0.9	16
E039.1	9/10/2013	4.4	2.0	5.9	35
E039.1	9/12/2013	3.6	1.6	7.6	77
E039.1	11/5/2013	0.9	0.4	2.2	21
E042.1	7/12/2013	817	366	20	160
E042.1	8/5/2013	29	13	9.4	80
E042.1	9/10/2013	48	21	17	36
E050.1	7/12/2013	39	17	4.3	32
E050.1	8/5/2013	6.1	2.7	1.7	20
E050.1	9/10/2013	4.6	2.1	6.4	11

Table 3.2-3 (continued)

Gaging Station	Date	Sediment Yield (tons)	Sediment Yield (yd^3)[a]	Runoff Volume (acre-ft)	Peak Discharge (cfs)
E050.1	9/12/2013	171	77	33	87
E099	7/12/2013	5748	2574	14	230
E099	8/5/2013	1015	455	6.7	340
E109.9	7/8/2013	3880	1737	12	110
E109.9	7/12/2013[b]	1326	594	26	180
E109.9	7/20/2013[b]	24,305	10,883	67	810
E109.9	7/25/2013	1639	734	11	100
E109.9	7/26/2013[b]	515	230	14	160
E109.9	8/3/2013	51,060	22,862	72	950
E109.9	8/5/2013b	3955	1771	50	1000
E109.9	8/9/2013	8524	3816	34	270
2014 Runoff Events					
E038	7/8/2014	6.5	2.9	1.7	46
E038	7/27/2014	7.9	3.5	2.9	148
E038	7/29/2014	11	4.8	5.5	94
E039.1	7/8/2014	1.1	0.5	0.7	14
E039.1	7/15/2014	1.3	0.6	3.2	15
E039.1	7/15/2014	58	26	11	317
E039.1	7/27/2014	1.6	0.7	1.9	22
E039.1	7/29/2014	7.8	3.5	6.2	66
E039.1	7/31/2014	31	14	11	250
E040	7/29/2014	4.2	1.9	9.4	95
E040	7/31/2014	9.8	4.4	14	239
E042.1	7/29/2014	186	83	16	92
E042.1	7/31/2014	551	247	21	210
E050.1	7/15/2014	67	30	8.8	49
E050.1	7/29/2014	41	18	11	63
E050.1	7/31/2014	204	91	22	214
E059.5	7/29/2014	30	13	3.0	44
E059.5	7/31/2014	98	44	4.7	97
2015 Runoff Events					
E038	06/26/2015	9.0	4.0	3.8	163
E038	07/20/2015	3.7	1.6	4.0	78
E038	07/31/2015	6.0	2.7	3.0	110
E038	08/08/2015	1.7	0.8	1.5	52
E039.1	05/21/2015	1.0	0.5	3.9	24
E039.1	06/26/2015[b]	2.8	1.3	3.0	66
E039.1	07/03/2015	3.1	1.4	2.3	51

Table 3.2-3 (continued)

Gaging Station	Date	Sediment Yield (tons)	Sediment Yield (yd^3)[a]	Runoff Volume (acre-ft)	Peak Discharge (cfs)
E039.1	07/07/2015	4.8	2.2	4.5	46
E039.1	07/29/2015	1.6	0.7	4.6	49
E039.1	08/08/2015	0.8	0.4	2.1	46
E039.1	10/21/2015	0.5	0.2	8.6	28
E042.1	07/03/2015	4.7	2.1	0.7	10
E042.1	07/07/2015	63	28	14	53
E042.1	07/20/2015	46	21	3.8	56
E042.1	07/31/2015	82	37	7.0	74
E042.1	10/21/2015	11	5.0	3.9	17
E050.1	07/07/2015	17	7.8	23	40
E050.1	07/20/2015	20	8.9	6.0	34
E050.1	07/29/2015	3.4	1.5	5.6	22
E050.1	08/08/2015	1.9	0.8	8.5	11
E050.1	10/21/2015	2.9	1.3	3.8	18
E050.1	10/23/2015[b]	0.6	0.3	1.6	5.4
E059.5	07/03/2015	533	239	3.9	50
E059.5	07/31/2015	44.8	20	2.3	73
E059.8	10/21/2015	1.1	0.5	2.9	10
E060.1	07/02/2015[b]	93	42	14	12
E060.1	07/20/2015	3.2	1.4	0.8	6.7
2016 Runoff Events					
E038	8/19/2016	5.5	2.5	1.5	80
E038	8/24/2016	6.0	2.7	2.4	129
E038	8/27/2016	7.1	3.2	2.8	103
E039.1	8/3/2016	0.8	0.4	1.7	27
E039.1	9/6/2016	0.7	0.3	1.3	42
E039.1	11/5/2016	0.7	0.3	3.0	25
E042.1	8/27/2016	60	27	4.0	63
E042.1	11/6/2016	2.4	1.1	0.8	12
E050.1	8/27/2016	9.9	4.4	3.0	25
E059.5	8/27/2016	23	10	3.5	45
2017 Runoff Events					
E038	7/8/2017	9327	4.6	2.0	110
E038	7/26/2017	24,828	12.3	4.5	205
E038	7/29/2017	3016	1.5	1.8	45
E038	8/7/2017	4013	2.0	1.9	76
E039.1	7/8/2017	4273	2.1	2.1	60
E039.1	7/26/2017	7881	3.9	3.4	150

Table 3.2-3 (continued)

Gaging Station	Date	Sediment Yield (tons)	Sediment Yield (yd^3)[a]	Runoff Volume (acre-ft)	Peak Discharge (cfs)
E039.1	7/29/2017	1247	0.6	1.7	45
E039.1	8/7/2017	394	0.2	0.8	18
E042.1	7/26/2017	20,223	10.0	2.5	30
E042.1	9/27/2017	7583	3.7	6.9	25
E042.1	9/29/2017	44,574	22.0	10.8	51
E042.1	10/4/2017	39,745	19.6	5.9	40
E050.1	9/27/2017	3781	1.9	9.7	32
E050.1	9/29/2017	15,899	7.8	17.3	56
E050.1	10/4/2017	11,842	5.8	16.3	35
E059.5	9/29/2017	22,036	10.9	6.8	61
E059.8	10/5/2017[b]	156	0.1	1.3	1.6
2018 Runoff Events					
E038	08/02/2018	2.5	1.1	1.8	66
E038	08/10/2018	4.0	1.8	2.0	88
E038	08/15/2018	3.8	1.7	1.9	64
E038	09/03/2018	3.8	1.7	1.0	46
E039.1	08/02/2018	0.4	0.2	13	24
E039.1	08/10/2018	1.9	0.9	2.2	50
E039.1	08/15/2018	0.3	0.1	1.5	20
E039.1	09/03/2018	0.1	0.0	0.8	14
E039.1	09/04/2018	2.6	1.2	5.0	75
E042.1	09/04/2018	4.0	1.8	1.5	10

Notes: Sediment yield and runoff volume were calculated only from sampled events with reliable hydrographs and sedigraphs. Thus, the September 12, 2013, sampling at E026 and E109.9 was excluded.

[a] Volumetric sediment yield was computed using a soil bulk density of 2650 kg/m^3 and volume = mass/density.

[b] Samples were not collected throughout the entire hydrograph (see Figures 3.2-3 and 3.2-4); thus, sediment yields may be underestimated.

Table 4.1-1
Comparison of Detected Analytical Results from 2018 with the Water Quality Criteria

Location ID	Location Alias	Sample Date	Analyte	Field Prep Code	Result	MDL/ MDA	PQL[a]	Unit[b]	Screening Level	Screening Level Type[c]	Hardness Used[d]
CO111041	CO111041	7/13/18	Copper	F[e]	5.53	0.3	1	µg/L	3.17	AAL	21.6
CO111041	CO111041	7/13/18	Total PCB	UF[f]	3.74	—[g]	—	µg/L	2	AAL	—
CO111041	CO111041	7/13/18	Total PCB	UF	3.74	—	—	µg/L	0.014	CAL	—
CO111041	CO111041	7/13/18	Total PCB	UF	3.74	—	—	µg/L	0.00064	HH-OO	—
CO111041	CO111041	7/13/18	Total PCB	UF	3.74	—	—	µg/L	0.014	WH	—
DP above TA-21	E038	8/2/18	Aluminum	F	299	19.3	50	µg/L	259.	AAL	15.2
DP above TA-21	E038	8/2/18	Copper	F	3.37	0.3	1	µg/L	2.28	AAL	15.2
DP above TA-21	E038	8/2/18	Gross alpha	UF	34.2	3.25	1.97	pCi/L	15	LW	—
DP above TA-21	E038	8/2/18	Total PCB	UF	0.463	—	—	µg/L	0.014	CAL	—
DP above TA-21	E038	8/2/18	Total PCB	UF	0.463	—	—	µg/L	0.00064	HH-OO	—
DP above TA-21	E038	8/2/18	Total PCB	UF	0.463	—	—	µg/L	0.014	WH	—
DP above TA-21	E038	8/10/18	Aluminum	F	249	19.3	50	µg/L	243	AAL	14.5
DP above TA-21	E038	8/10/18	Copper	F	3.58	0.3	1	µg/L	2.187	AAL	14.5
DP above TA-21	E038	8/10/18	Gross alpha	UF	26.1	4.3	2.05	pCi/L	15	LW	—
DP above TA-21	E038	8/10/18	Total PCB	UF	0.0449	—	—	µg/L	0.014	CAL	—
DP above TA-21	E038	8/10/18	Total PCB	UF	0.0449	—	—	µg/L	0.00064	HH-OO	—
DP above TA-21	E038	8/10/18	Total PCB	UF	0.0449	—	—	µg/L	0.014	WH	—
DP above TA-21	E038	8/10/18	Zinc	F	33.2	3.3	10	µg/L	27.6	AAL	14.5
DP above TA-21	E038	8/15/18	Copper	F	3.4	0.3	1	µg/L	2.60	AAL	17.5
DP above TA-21	E038	8/15/18	Gross alpha	UF	21.6	2.2	1.36	pCi/L	15	LW	—
DP above TA-21	E038	8/15/18	Total PCB	UF	0.0354	—	—	µg/L	0.014	CAL	—
DP above TA-21	E038	8/15/18	Total PCB	UF	0.0354	—	—	µg/L	0.00064	HH-OO	—
DP above TA-21	E038	8/15/18	Total PCB	UF	0.0354	—	—	µg/L	0.014	WH	—

Table 4.1-1 (continued)

Location ID	Location Alias	Sample Date	Analyte	Field Prep Code	Result	MDL/ MDA	PQL[a]	Unit[b]	Screening Level	Screening Level Type[c]	Hardness Used[d]
DP above TA-21	E038	9/3/18	Aluminum	F	207	19.3	50	µg/L	200	AAL	12.6
DP above TA-21	E038	9/3/18	Copper	F	2.19	0.3	1	µg/L	1.91	AAL	12.6
DP above TA-21	E038	9/3/18	Total PCB	UF	0.0365	—	—	µg/L	0.014	CAL	—
DP above TA-21	E038	9/3/18	Total PCB	UF	0.0365	—	—	µg/L	0.00064	HH-OO	—
DP above TA-21	E038	9/3/18	Total PCB	UF	0.0365	—	—	µg/L	0.014	WH	—
DP below grade ctrl structure	E039.1	8/2/18	Copper	F	6.56	0.3	1	µg/L	3.63	AAL	24.9
DP below grade ctrl structure	E039.1	8/2/18	Gross alpha	UF	15.4	2.26	1.23	pCi/L	15	LW	—
DP below grade ctrl structure	E039.1	8/2/18	Total PCB	UF	0.0133	—	—	µg/L	0.00064	HH-OO	—
DP below grade ctrl structure	E039.1	8/10/18	Gross alpha	UF	60.2	2.96	2.51	pCi/L	15	LW	—
DP below grade ctrl structure	E039.1	8/10/18	Total PCB	UF	0.0303	—	—	µg/L	0.014	CAL	—
DP below grade ctrl structure	E039.1	8/10/18	Total PCB	UF	0.0303	—	—	µg/L	0.00064	HH-OO	—
DP below grade ctrl structure	E039.1	8/10/18	Total PCB	UF	0.0303	—	—	µg/L	0.014	WH	—
DP below grade ctrl structure	E039.1	8/15/18	Aluminum	F	509	19.3	50	µg/L	498	AAL	24.5
DP below grade ctrl structure	E039.1	8/15/18	Copper	F	4.16	0.3	1	µg/L	3.57	AAL	24.5
DP below grade ctrl structure	E039.1	8/15/18	Total PCB	UF	0.011	—	—	µg/L	0.00064	HH-OO	—
DP below grade ctrl structure	E039.1	9/3/18	Total PCB	UF	0.0122	—	—	µg/L	0.00064	HH-OO	—
DP below grade ctrl structure	E039.1	9/4/18	Aluminum	F	403	19.3	50	µg/L	266	AAL	15.5
DP below grade ctrl structure	E039.1	9/4/18	Copper	F	2.85	0.3	1	µg/L	2.32	AAL	15.5
DP below grade ctrl structure	E039.1	9/4/18	Gross alpha	UF	30.9	3	1.93	pCi/L	15	LW	—
DP below grade ctrl structure	E039.1	9/4/18	Total PCB	UF	0.0108	—	—	µg/L	0.00064	HH-OO	—
DP above Los Alamos Canyon	E040	8/10/18	Gross alpha	UF	104	5.76	4.27	pCi/L	15	LW	—
DP above Los Alamos Canyon	E040	8/10/18	Total PCB	UF	0.0667	—	—	µg/L	0.014	CAL	—
DP above Los Alamos Canyon	E040	8/10/18	Total PCB	UF	0.0667	—	—	µg/L	0.00064	HH-OO	—
DP above Los Alamos Canyon	E040	8/10/18	Total PCB	UF	0.0667	—	—	µg/L	0.014	WH	—

Table 4.1-1 (continued)

Location ID	Location Alias	Sample Date	Analyte	Field Prep Code	Result	MDL/ MDA	PQL[a]	Unit[b]	Screening Level	Screening Level Type[c]	Hardness Used[d]
DP above Los Alamos Canyon	E040	9/4/18	Aluminum	F	484	19.3	50	µg/L	307	AAL	17.2
DP above Los Alamos Canyon	E040	9/4/18	Gross alpha	UF	99.7	3	4.45	pCi/L	15	LW	—
DP above Los Alamos Canyon	E040	9/4/18	Total PCB	UF	0.222	—	—	µg/L	0.014	CAL	—
DP above Los Alamos Canyon	E040	9/4/18	Total PCB	UF	0.222	—	—	µg/L	0.00064	HH-OO	—
DP above Los Alamos Canyon	E040	9/4/18	Total PCB	UF	0.222	—	—	µg/L	0.014	WH	—
DP above Los Alamos Canyon	E040	9/5/18	Gross alpha	UF	15.3	2.6	1.36	pCi/L	15	LW	—
DP above Los Alamos Canyon	E040	9/5/18	Total PCB	UF	0.00731	—	—	µg/L	0.00064	HH-OO	—
DP above Los Alamos Canyon	E040	10/23/18	Gross alpha	UF	19.9	3.13	1.51	pCi/L	15	LW	—
DP above Los Alamos Canyon	E040	10/23/18	Total PCB	UF	0.025	—	—	µg/L	0.014	CAL	—
DP above Los Alamos Canyon	E040	10/23/18	Total PCB	UF	0.025	—	—	µg/L	0.00064	HH-OO	—
DP above Los Alamos Canyon	E040	10/23/18	Total PCB	UF	0.025	—	—	µg/L	0.014	WH	—
Los Alamos above low-head weir	E042.1	9/4/18	Aluminum	F	403	19.3	50	µg/L	370	AAL	19.7
Los Alamos above low-head weir	E042.1	9/4/18	Gross alpha	UF	284	9.07	9.17	pCi/L	15	LW	—
Los Alamos above low-head weir	E042.1	9/4/18	Selenium	UF	7	2	5	µg/L	5	CAL	—
Los Alamos above low-head weir	E042.1	9/4/18	Selenium	UF	7	2	5	µg/L	5	WH	—
Los Alamos above low-head weir	E042.1	9/4/18	Total PCB	UF	0.0612	—	—	µg/L	0.014	CAL	—
Los Alamos above low-head weir	E042.1	9/4/18	Total PCB	UF	0.0428	—	—	µg/L	0.014	CAL	—
Los Alamos above low-head weir	E042.1	9/4/18	Total PCB	UF	0.0612	—	—	µg/L	0.00064	HH-OO	—
Los Alamos above low-head weir	E042.1	9/4/18	Total PCB	UF	0.0428	—	—	µg/L	0.00064	HH-OO	—
Los Alamos above low-head weir	E042.1	9/4/18	Total PCB	UF	0.0612	—	—	µg/L	0.014	WH	—
Los Alamos above low-head weir	E042.1	9/4/18	Total PCB	UF	0.0428	—	—	µg/L	0.014	WH	—
Pueblo above Acid	E055	8/9/18	Aluminum	F	459	19.3	50	µg/L	125	CAL	17.4
Pueblo above Acid	E055	8/9/18	Copper	F	2.28	0.3	1	µg/L	2.01	CAL	17.4
Pueblo above Acid	E055	8/9/18	Gross alpha	UF	112	4.71	4.37	pCi/L	15	LW	—

Table 4.1-1 (continued)

Location ID	Location Alias	Sample Date	Analyte	Field Prep Code	Result	MDL/ MDA	PQL[a]	Unit[b]	Screening Level	Screening Level Type[c]	Hardness Used[d]
Pueblo above Acid	E055	8/9/18	Lead	F	1.1	0.5	2	µg/L	0.359	CAL	17.4
Pueblo above Acid	E055	8/9/18	Total PCB	UF	0.0371	—	—	µg/L	0.014	CAL	—
Pueblo above Acid	E055	8/9/18	Total PCB	UF	0.0371	—	—	µg/L	0.00064	HH-OO	—
Pueblo above Acid	E055	8/9/18	Total PCB	UF	0.0371	—	—	µg/L	0.014	WH	—
South Fork of Acid Canyon	E055.5	8/2/18	Aluminum	F	511	19.3	50	µg/L	110	CAL	15.8
South Fork of Acid Canyon	E055.5	8/2/18	Copper	F	3.84	0.3	1	µg/L	1.85	CAL	15.8
South Fork of Acid Canyon	E055.5	8/2/18	Gross alpha	UF	41.2	2.74	1.93	pCi/L	15	LW	—
South Fork of Acid Canyon	E055.5	8/2/18	Lead	F	1.16	0.5	2	µg/L	0.3212	CAL	15.8
South Fork of Acid Canyon	E055.5	8/2/18	Total PCB	UF	0.0415	—	—	µg/L	0.014	CAL	—
South Fork of Acid Canyon	E055.5	8/2/18	Total PCB	UF	0.0415	—	—	µg/L	0.00064	HH-OO	—
South Fork of Acid Canyon	E055.5	8/2/18	Total PCB	UF	0.0415	—	—	µg/L	0.014	WH	—
South Fork of Acid Canyon	E055.5	9/3/18	Aluminum	F	380	19.3	50	µg/L	82.1	CAL	12.8
South Fork of Acid Canyon	E055.5	9/3/18	Copper	F	2.2	0.3	1	µg/L	1.55	CAL	12.8
South Fork of Acid Canyon	E055.5	9/3/18	Gross alpha	UF	33	2.88	2.95	pCi/L	15	LW	—
South Fork of Acid Canyon	E055.5	9/3/18	Lead	F	0.854	0.5	2	µg/L	0.253	CAL	12.8
South Fork of Acid Canyon	E055.5	9/3/18	Total PCB	UF	0.0825	—	—	µg/L	0.014	CAL	—
South Fork of Acid Canyon	E055.5	9/3/18	Total PCB	UF	0.0825	—	—	µg/L	0.00064	HH-OO	—
South Fork of Acid Canyon	E055.5	9/3/18	Total PCB	UF	0.0825	—	—	µg/L	0.014	WH	—
Acid above Pueblo	E056	7/13/18	Aluminum	F	338	19.3	50	µg/L	132	CAL	18.1
Acid above Pueblo	E056	7/13/18	Copper	F	4.14	0.3	1	µg/L	2.08	CAL	18.1
Acid above Pueblo	E056	7/13/18	Gross alpha	UF	27.2	4.29	1.97	pCi/L	15	LW	—
Acid above Pueblo	E056	7/13/18	Lead	F	0.641	0.5	2	µg/L	0.376	CAL	18.1
Acid above Pueblo	E056	7/13/18	Total PCB	UF	0.0445	—	—	µg/L	0.014	CAL	—
Acid above Pueblo	E056	7/13/18	Total PCB	UF	0.0445	—	—	µg/L	0.00064	HH-OO	—

Table 4.1-1 (continued)

Location ID	Location Alias	Sample Date	Analyte	Field Prep Code	Result	MDL/ MDA	PQL[a]	Unit[b]	Screening Level	Screening Level Type[c]	Hardness Used[d]
Acid above Pueblo	E056	7/13/18	Total PCB	UF	0.0445	—	—	µg/L	0.014	WH	—
Acid above Pueblo	E056	7/17/18	Aluminum	F	279	19.3	50	µg/L	77.7	CAL	12.3
Acid above Pueblo	E056	7/17/18	Copper	F	3.4	0.3	1	µg/L	1.49	CAL	12.3
Acid above Pueblo	E056	7/17/18	Gross alpha	UF	29.8	3.34	1.8	pCi/L	15	LW	—
Acid above Pueblo	E056	7/17/18	Lead	F	0.559	0.5	2	µg/L	0.242	CAL	12.3
Acid above Pueblo	E056	7/17/18	Total PCB	UF	0.0261	—	—	µg/L	0.014	CAL	—
Acid above Pueblo	E056	7/17/18	Total PCB	UF	0.0261	—	—	µg/L	0.00064	HH-OO	—
Acid above Pueblo	E056	7/17/18	Total PCB	UF	0.0261	—	—	µg/L	0.014	WH	—
Acid above Pueblo	E056	8/9/18	Aluminum	F	656	19.3	50	µg/L	89.2	CAL	13.6
Acid above Pueblo	E056	8/9/18	Copper	F	4.06	0.3	1	µg/L	1.63	CAL	13.6
Acid above Pueblo	E056	8/9/18	Gross alpha	UF	23.5	2.85	1.62	pCi/L	15	LW	—
Acid above Pueblo	E056	8/9/18	Lead	F	1.87	0.5	2	µg/L	0.271	CAL	13.6
Acid above Pueblo	E056	8/9/18	Total PCB	UF	0.0303	—	—	µg/L	0.014	CAL	—
Acid above Pueblo	E056	8/9/18	Total PCB	UF	0.0303	—	—	µg/L	0.00064	HH-OO	—
Acid above Pueblo	E056	8/9/18	Total PCB	UF	0.0303	—	—	µg/L	0.014	WH	—
Acid above Pueblo	E056	8/9/18	Zinc	F	24.9	3.3	10	µg/L	19.7	CAL	13.6
Acid above Pueblo	E056	9/4/18	Aluminum	F	555	19.3	50	µg/L	95.5	CAL	14.3
Acid above Pueblo	E056	9/4/18	Copper	F	3.2	0.3	1	µg/L	1.70	CAL	14.3
Acid above Pueblo	E056	9/4/18	Gross alpha	UF	25.1	2.97	1.77	pCi/L	15	LW	—

Table 4.1-1 (continued)

Location ID	Location Alias	Sample Date	Analyte	Field Prep Code	Result	MDL/ MDA	PQL[a]	Unit[b]	Screening Level	Screening Level Type[c]	Hardness Used[d]
Acid above Pueblo	E056	9/4/18	Lead	F	0.881	0.5	2	µg/L	0.287	CAL	14.3
Acid above Pueblo	E056	9/4/18	Total PCB	UF	0.0574	—	—	µg/L	0.014	CAL	—
Acid above Pueblo	E056	9/4/18	Total PCB	UF	0.0574	—	—	µg/L	0.00064	HH-OO	—
Acid above Pueblo	E056	9/4/18	Total PCB	UF	0.0574	—	—	µg/L	0.014	WH	—

[a] PQL = Practical quantitation limit or uncertainty.

[b] Unit applies to result, method detection limit (MDL), practical quantitation limit (PQL), and screening level.

[c] AAL = acute aquatic life, CAL = chronic aquatic life, HH-OO = human health-organism only, LW = livestock watering, WH = wildlife habitat.

[d] The hardness measured during the storm event was used to calculate hardness-based screening levels.

[e] F = Filtered.

[f] UF = Unfiltered.

[g] — = Not provided by the laboratory or not applicable.

Table 4.2-1
Calculated SSC and Instantaneous Discharge
Determined for Each Sample Collected during 2018 in the LA/P Watershed

Station	Sample Collection Date and Time	Field Sample ID	Field Prep	SSC Source[a]	Calculated SSC (mg/L)	Calculated Instantaneous Discharge (cfs)
CO111041	7/13/18 13:28	WT_LAP-18-155667	UF[b]	Estimated	200	n/a[c]
CO111041	7/13/18 13:30	WT_LAP-18-156027	UF	Estimated	200	n/a
CO111041	7/13/18 13:30	WT_LAP-18-155787	UF	Estimated	200	n/a
CO111041	7/13/18 13:30	WT_LAP-18-155907	F[d]	Estimated	200	n/a
CO111041	7/13/18 13:30	WT_LAP-18-155967	F	Estimated	200	n/a
CO111041	7/13/18 13:32	WT_LAP-18-155727	F	Estimated	200	n/a
CO111041	7/13/18 13:36	WT_LAP-18-156975	UF	Estimated	200	n/a
CO111041	7/13/18 13:37	WT_LAP-18-156966	UF	Estimated	200	n/a
CO111041	7/13/18 13:39	WT_LAP-18-155847	UF	SSC	200	n/a
CO111041	7/13/18 13:41	WT_LAP-18-155607	UF	SSC	700	n/a
E038	8/2/18 18:54	WT_LAP-18-156085	UF	SSC	2300	53
E038	8/2/18 18:57	WT_LAP-18-156086	UF	SSC	2000	59
E038	8/2/18 18:59	WT_LAP-18-156087	UF	SSC	1500	53
E038	8/2/18 19:01	WT_LAP-18-156088	UF	SSC	1300	47
E038	8/2/18 19:03	WT_LAP-18-156089	UF	SSC	1200	42
E038	8/2/18 19:05	WT_LAP-18-155609	UF	SSC	1200	37
E038	8/2/18 19:06	WT_LAP-18-156090	UF	SSC	1300	34
E038	8/2/18 19:07	WT_LAP-18-155669	UF	Estimated	1200	31
E038	8/2/18 19:08	WT_LAP-18-156091	UF	SSC	1100	28
E038	8/2/18 19:09	WT_LAP-18-155789	UF	Estimated	1100	26
E038	8/2/18 19:09	WT_LAP-18-156029	UF	Estimated	1100	26
E038	8/2/18 19:09	WT_LAP-18-155909	F	Estimated	1100	26
E038	8/2/18 19:09	WT_LAP-18-155969	F	Estimated	1100	26
E038	8/2/18 19:10	WT_LAP-18-156092	UF	SSC	1100	23
E038	8/2/18 19:13	WT_LAP-18-156093	UF	SSC	1000	17
E038	8/2/18 19:13	WT_LAP-18-155729	F	Estimated	1000	17
E038	8/2/18 19:15	WT_LAP-18-156094	UF	SSC	900	14
E038	8/2/18 19:15	WT_LAP-18-156977	UF	Estimated	900	14
E038	8/2/18 19:17	WT_LAP-18-156095	UF	SSC	700	12
E038	8/2/18 19:17	WT_LAP-18-156926	UF	Estimated	700	12
E038	8/2/18 19:19	WT_LAP-18-156801	UF	Estimated	630	11

Table 4.2-1 (continued)

Station	Sample Collection Date and Time	Field Sample ID	Field Prep	SSC Source[a]	Calculated SSC (mg/L)	Calculated Instantaneous Discharge (cfs)
E038	8/2/18 19:19	WT_LAP-18-156878	UF	Estimated	630	11
E038	8/2/18 19:20	WT_LAP-18-156096	UF	SSC	600	10
E038	8/2/18 19:23	WT_LAP-18-155849	UF	SSC	500	8.7
E038	8/2/18 19:23	WT_LAP-18-155849	UF	SSC	400	8.7
E038	8/2/18 19:24	WT_LAP-18-156100	UF	SSC	400	8.3
E038	8/2/18 19:44	WT_LAP-18-156101	UF	SSC	200	7.1
E038	8/2/18 20:04	WT_LAP-18-156102	UF	SSC	100	1.9
E038	8/10/18 16:10	WT_LAP-18-156253	UF	SSC	3500	88
E038	8/10/18 16:12	WT_LAP-18-156254	UF	SSC	3100	73
E038	8/10/18 16:14	WT_LAP-18-156255	UF	SSC	2500	57
E038	8/10/18 16:16	WT_LAP-18-156256	UF	SSC	2100	47
E038	8/10/18 16:19	WT_LAP-18-156257	UF	SSC	1700	39
E038	8/10/18 16:20	WT_LAP-18-155624	UF	SSC	1500	36
E038	8/10/18 16:21	WT_LAP-18-156258	UF	SSC	1500	34
E038	8/10/18 16:23	WT_LAP-18-156259	UF	SSC	1400	29
E038	8/10/18 16:23	WT_LAP-18-155684	UF	Estimated	1400	29
E038	8/10/18 16:25	WT_LAP-18-156260	UF	SSC	1800	23
E038	8/10/18 16:25	WT_LAP-18-155804	UF	Estimated	1800	23
E038	8/10/18 16:25	WT_LAP-18-156044	UF	Estimated	1800	23
E038	8/10/18 16:25	WT_LAP-18-155924	F	Estimated	1800	23
E038	8/10/18 16:25	WT_LAP-18-155984	F	Estimated	1800	23
E038	8/10/18 16:28	WT_LAP-18-156261	UF	SSC	1200	19
E038	8/10/18 16:29	WT_LAP-18-155744	F	Estimated	1200	17
E038	8/10/18 16:30	WT_LAP-18-156262	UF	SSC	1300	16
E038	8/10/18 16:31	WT_LAP-18-156992	UF	Estimated	1100	14
E038	8/10/18 16:32	WT_LAP-18-156263	UF	SSC	900	13
E038	8/10/18 16:34	WT_LAP-18-156936	UF	Estimated	770	11
E038	8/10/18 16:35	WT_LAP-18-156264	UF	SSC	700	10
E038	8/10/18 16:36	WT_LAP-18-156816	UF	Estimated	700	9.5
E038	8/10/18 16:36	WT_LAP-18-156888	UF	Estimated	700	9.5
E038	8/10/18 16:37	WT_LAP-18-156265	UF	SSC	700	8.9
E038	8/10/18 16:40	WT_LAP-18-155864	UF	SSC	700	7.3
E038	8/10/18 16:40	WT_LAP-18-156268	UF	SSC	600	7.3
E038	8/10/18 17:00	WT_LAP-18-156269	UF	SSC	200	2.1

Table 4.2-1 (continued)

Station	Sample Collection Date and Time	Field Sample ID	Field Prep	SSC Source[a]	Calculated SSC (mg/L)	Calculated Instantaneous Discharge (cfs)
E038	8/10/18 17:20	WT_LAP-18-156270	UF	SSC	100	1.4
E038	8/15/18 12:59	WT_LAP-18-156421	UF	SSC	3000	51
E038	8/15/18 13:02	WT_LAP-18-156422	UF	SSC	2300	61
E038	8/15/18 13:04	WT_LAP-18-156423	UF	SSC	1800	58
E038	8/15/18 13:06	WT_LAP-18-156424	UF	SSC	1800	52
E038	8/15/18 13:08	WT_LAP-18-156425	UF	SSC	1700	42
E038	8/15/18 13:09	WT_LAP-18-156426	UF	SSC	1500	38
E038	8/15/18 13:10	WT_LAP-18-155639	UF	SSC	1400	33
E038	8/15/18 13:11	WT_LAP-18-156427	UF	SSC	1500	30
E038	8/15/18 13:13	WT_LAP-18-156428	UF	SSC	1500	25
E038	8/15/18 13:13	WT_LAP-18-155699	UF	Estimated	1500	25
E038	8/15/18 13:15	WT_LAP-18-156429	UF	SSC	1300	20
E038	8/15/18 13:15	WT_LAP-18-155819	UF	Estimated	1300	20
E038	8/15/18 13:15	WT_LAP-18-156059	UF	Estimated	1300	20
E038	8/15/18 13:15	WT_LAP-18-155939	F	Estimated	1300	20
E038	8/15/18 13:15	WT_LAP-18-155999	F	Estimated	1300	20
E038	8/15/18 13:17	WT_LAP-18-156430	UF	SSC	1100	18
E038	8/15/18 13:19	WT_LAP-18-156431	UF	SSC	1300	16
E038	8/15/18 13:19	WT_LAP-18-155759	F	Estimated	1300	16
E038	8/15/18 13:21	WT_LAP-18-156432	UF	SSC	1100	15
E038	8/15/18 13:21	WT_LAP-18-157007	UF	Estimated	1100	15
E038	8/15/18 13:23	WT_LAP-18-156946	UF	Estimated	1000	14
E038	8/15/18 13:24	WT_LAP-18-156433	UF	SSC	1000	13
E038	8/15/18 13:25	WT_LAP-18-156831	UF	Estimated	900	12
E038	8/15/18 13:25	WT_LAP-18-156898	UF	Estimated	900	12
E038	8/15/18 13:26	WT_LAP-18-156434	UF	SSC	800	12
E038	8/15/18 13:29	WT_LAP-18-156436	UF	SSC	700	11
E038	8/15/18 13:30	WT_LAP-18-155879	UF	SSC	700	11
E038	8/15/18 13:49	WT_LAP-18-156437	UF	SSC	400	6.3
E038	8/15/18 14:09	WT_LAP-18-156438	UF	SSC	200	1.9
E038	9/3/18 12:29	WT_LAP-18-156589	UF	SSC	2100	37
E038	9/3/18 12:31	WT_LAP-18-156590	UF	SSC	1700	45
E038	9/3/18 12:33	WT_LAP-18-156591	UF	SSC	1500	42
E038	9/3/18 12:35	WT_LAP-18-156592	UF	SSC	1500	40

Table 4.2-1 (continued)

Station	Sample Collection Date and Time	Field Sample ID	Field Prep	SSC Source[a]	Calculated SSC (mg/L)	Calculated Instantaneous Discharge (cfs)
E038	9/3/18 12:37	WT_LAP-18-156593	UF	SSC	1600	32
E038	9/3/18 12:39	WT_LAP-18-156594	UF	SSC	1800	23
E038	9/3/18 12:40	WT_LAP-18-155654	UF	SSC	1600	19
E038	9/3/18 12:41	WT_LAP-18-156595	UF	SSC	1600	18
E038	9/3/18 12:42	WT_LAP-18-155714	UF	Estimated	1500	17
E038	9/3/18 12:43	WT_LAP-18-156596	UF	SSC	1400	15
E038	9/3/18 12:44	WT_LAP-18-155834	UF	Estimated	1200	14
E038	9/3/18 12:44	WT_LAP-18-156074	UF	Estimated	1200	14
E038	9/3/18 12:44	WT_LAP-18-155954	F	Estimated	1200	14
E038	9/3/18 12:44	WT_LAP-18-156014	F	Estimated	1200	14
E038	9/3/18 12:45	WT_LAP-18-156597	UF	SSC	1100	12
E038	9/3/18 12:47	WT_LAP-18-156598	UF	SSC	700	10
E038	9/3/18 12:48	WT_LAP-18-155774	F	Estimated	800	9.2
E038	9/3/18 12:49	WT_LAP-18-156599	UF	SSC	900	8.2
E038	9/3/18 12:50	WT_LAP-18-157022	UF	Estimated	850	7.2
E038	9/3/18 12:51	WT_LAP-18-156600	UF	SSC	800	6.6
E038	9/3/18 12:52	WT_LAP-18-156956	UF	Estimated	750	6
E038	9/3/18 12:53	WT_LAP-18-156601	UF	SSC	700	5.5
E038	9/3/18 12:54	WT_LAP-18-156846	UF	Estimated	600	4.9
E038	9/3/18 12:54	WT_LAP-18-156908	UF	Estimated	600	4.9
E038	9/3/18 12:55	WT_LAP-18-156602	UF	SSC	500	4.4
E038	9/3/18 12:57	WT_LAP-18-156603	UF	SSC	400	3.8
E038	9/3/18 12:58	WT_LAP-18-155894	UF	SSC	400	3.5
E038	9/3/18 12:59	WT_LAP-18-156604	UF	SSC	300	3.2
E038	9/3/18 13:19	WT_LAP-18-156605	UF	SSC	200	1
E038	9/3/18 13:39	WT_LAP-18-156606	UF	SSC	100	0.68
E039.1	8/2/18 19:38	WT_LAP-18-156109	UF	SSC	500	23
E039.1	8/2/18 19:40	WT_LAP-18-156110	UF	SSC	500	24
E039.1	8/2/18 19:42	WT_LAP-18-156111	UF	SSC	400	22
E039.1	8/2/18 19:44	WT_LAP-18-156112	UF	SSC	400	20
E039.1	8/2/18 19:46	WT_LAP-18-156113	UF	SSC	300	18
E039.1	8/2/18 19:48	WT_LAP-18-156114	UF	SSC	300	17
E039.1	8/2/18 19:49	WT_LAP-18-155610	UF	SSC	300	16
E039.1	8/2/18 19:50	WT_LAP-18-156115	UF	SSC	300	15

Table 4.2-1 (continued)

Station	Sample Collection Date and Time	Field Sample ID	Field Prep	SSC Source[a]	Calculated SSC (mg/L)	Calculated Instantaneous Discharge (cfs)
E039.1	8/2/18 19:51	WT_LAP-18-155670	UF	Estimated	300	15
E039.1	8/2/18 19:52	WT_LAP-18-156116	UF	SSC	300	14
E039.1	8/2/18 19:53	WT_LAP-18-155790	UF	Estimated	250	13
E039.1	8/2/18 19:53	WT_LAP-18-156030	UF	Estimated	250	13
E039.1	8/2/18 19:53	WT_LAP-18-155910	F	Estimated	250	13
E039.1	8/2/18 19:53	WT_LAP-18-155970	F	Estimated	250	13
E039.1	8/2/18 19:54	WT_LAP-18-156117	UF	SSC	200	13
E039.1	8/2/18 19:56	WT_LAP-18-156118	UF	SSC	200	12
E039.1	8/2/18 19:57	WT_LAP-18-155730	F	Estimated	200	12
E039.1	8/2/18 19:58	WT_LAP-18-156119	UF	SSC	200	12
E039.1	8/2/18 19:59	WT_LAP-18-156978	UF	Estimated	200	11
E039.1	8/2/18 20:00	WT_LAP-18-156120	UF	SSC	200	11
E039.1	8/2/18 20:01	WT_LAP-18-156927	UF	Estimated	200	11
E039.1	8/2/18 20:02	WT_LAP-18-156121	UF	SSC	200	11
E039.1	8/2/18 20:03	WT_LAP-18-156802	UF	Estimated	200	11
E039.1	8/2/18 20:03	WT_LAP-18-156879	UF	Estimated	200	11
E039.1	8/2/18 20:04	WT_LAP-18-156122	UF	SSC	200	11
E039.1	8/2/18 20:06	WT_LAP-18-156123	UF	SSC	200	11
E039.1	8/2/18 20:07	WT_LAP-18-155850	UF	SSC	200	10
E039.1	8/2/18 20:08	WT_LAP-18-156124	UF	SSC	200	10
E039.1	8/2/18 20:28	WT_LAP-18-156125	UF	SSC	100	9.8
E039.1	8/2/18 20:48	WT_LAP-18-156126	UF	SSC	100	9.6
E039.1	8/10/18 16:39	WT_LAP-18-156277	UF	SSC	1800	44
E039.1	8/10/18 16:41	WT_LAP-18-156278	UF	SSC	1500	49
E039.1	8/10/18 16:43	WT_LAP-18-156279	UF	SSC	1400	47
E039.1	8/10/18 16:45	WT_LAP-18-156280	UF	SSC	1200	44
E039.1	8/10/18 16:47	WT_LAP-18-156281	UF	SSC	1100	41
E039.1	8/10/18 16:49	WT_LAP-18-156282	UF	SSC	1000	38
E039.1	8/10/18 16:50	WT_LAP-18-155625	UF	SSC	900	36
E039.1	8/10/18 16:51	WT_LAP-18-156283	UF	SSC	900	34
E039.1	8/10/18 16:52	WT_LAP-18-155685	UF	Estimated	850	33
E039.1	8/10/18 16:53	WT_LAP-18-156284	UF	SSC	800	31
E039.1	8/10/18 16:54	WT_LAP-18-155805	UF	Estimated	750	30
E039.1	8/10/18 16:54	WT_LAP-18-155925	F	Estimated	750	30

Table 4.2-1 (continued)

Station	Sample Collection Date and Time	Field Sample ID	Field Prep	SSC Source[a]	Calculated SSC (mg/L)	Calculated Instantaneous Discharge (cfs)
E039.1	8/10/18 16:54	WT_LAP-18-155985	F	Estimated	750	30
E039.1	8/10/18 16:54	WT_LAP-18-156045	UF	Estimated	750	30
E039.1	8/10/18 16:55	WT_LAP-18-156285	UF	SSC	700	28
E039.1	8/10/18 16:57	WT_LAP-18-156286	UF	SSC	600	25
E039.1	8/10/18 16:58	WT_LAP-18-155745	F	Estimated	600	23
E039.1	8/10/18 16:59	WT_LAP-18-156287	UF	SSC	600	22
E039.1	8/10/18 17:00	WT_LAP-18-156993	UF	Estimated	600	20
E039.1	8/10/18 17:01	WT_LAP-18-156288	UF	SSC	600	19
E039.1	8/10/18 17:02	WT_LAP-18-156937	UF	Estimated	550	18
E039.1	8/10/18 17:03	WT_LAP-18-156289	UF	SSC	500	17
E039.1	8/10/18 17:04	WT_LAP-18-156817	UF	Estimated	500	16
E039.1	8/10/18 17:04	WT_LAP-18-156889	UF	Estimated	500	16
E039.1	8/10/18 17:05	WT_LAP-18-156290	UF	SSC	500	16
E039.1	8/10/18 17:07	WT_LAP-18-156291	UF	SSC	400	14
E039.1	8/10/18 17:08	WT_LAP-18-155865	UF	SSC	500	14
E039.1	8/10/18 17:09	WT_LAP-18-156292	UF	SSC	400	13
E039.1	8/10/18 17:29	WT_LAP-18-156293	UF	SSC	300	6.1
E039.1	8/15/18 13:49	WT_LAP-18-156445	UF	SSC	400	20
E039.1	8/15/18 13:51	WT_LAP-18-156446	UF	SSC	400	19
E039.1	8/15/18 13:53	WT_LAP-18-156447	UF	SSC	300	18
E039.1	8/15/18 13:54	WT_LAP-18-155640	UF	SSC	300	17
E039.1	8/15/18 13:55	WT_LAP-18-156448	UF	SSC	300	17
E039.1	8/15/18 13:56	WT_LAP-18-155700	UF	Estimated	300	17
E039.1	8/15/18 13:57	WT_LAP-18-156449	UF	SSC	300	16
E039.1	8/15/18 13:58	WT_LAP-18-155820	UF	Estimated	300	16
E039.1	8/15/18 13:58	WT_LAP-18-155940	F	Estimated	300	16
E039.1	8/15/18 13:58	WT_LAP-18-156000	F	Estimated	300	16
E039.1	8/15/18 13:58	WT_LAP-18-156060	UF	Estimated	300	16
E039.1	8/15/18 13:59	WT_LAP-18-156450	UF	SSC	300	16
E039.1	8/15/18 14:01	WT_LAP-18-156451	UF	SSC	300	15
E039.1	8/15/18 14:02	WT_LAP-18-155760	F	Estimated	300	15
E039.1	8/15/18 14:03	WT_LAP-18-156452	UF	SSC	300	15
E039.1	8/15/18 14:04	WT_LAP-18-157008	UF	Estimated	300	15
E039.1	8/15/18 14:05	WT_LAP-18-156453	UF	SSC	300	15

Table 4.2-1 (continued)

Station	Sample Collection Date and Time	Field Sample ID	Field Prep	SSC Source[a]	Calculated SSC (mg/L)	Calculated Instantaneous Discharge (cfs)
E039.1	8/15/18 14:06	WT_LAP-18-156947	UF	Estimated	300	14
E039.1	8/15/18 14:07	WT_LAP-18-156454	UF	SSC	300	14
E039.1	8/15/18 14:08	WT_LAP-18-156832	UF	Estimated	250	14
E039.1	8/15/18 14:08	WT_LAP-18-156899	UF	Estimated	250	14
E039.1	8/15/18 14:09	WT_LAP-18-156455	UF	SSC	200	13
E039.1	8/15/18 14:11	WT_LAP-18-156456	UF	SSC	200	13
E039.1	8/15/18 14:12	WT_LAP-18-155880	UF	SSC	200	13
E039.1	8/15/18 14:13	WT_LAP-18-156457	UF	SSC	200	12
E039.1	8/15/18 14:15	WT_LAP-18-156458	UF	SSC	200	12
E039.1	8/15/18 14:17	WT_LAP-18-156459	UF	SSC	200	11
E039.1	8/15/18 14:19	WT_LAP-18-156460	UF	SSC	200	11
E039.1	8/15/18 14:39	WT_LAP-18-156461	UF	SSC	200	5.1
E039.1	9/3/18 13:17	WT_LAP-18-156613	UF	SSC	300	14
E039.1	9/3/18 13:19	WT_LAP-18-156614	UF	SSC	300	14
E039.1	9/3/18 13:21	WT_LAP-18-156615	UF	SSC	200	14
E039.1	9/3/18 13:22	WT_LAP-18-155655	UF	SSC	300	14
E039.1	9/3/18 13:23	WT_LAP-18-156616	UF	SSC	200	13
E039.1	9/3/18 13:24	WT_LAP-18-155715	UF	Estimated	200	13
E039.1	9/3/18 13:25	WT_LAP-18-156617	UF	SSC	200	12
E039.1	9/3/18 13:26	WT_LAP-18-155835	UF	Estimated	200	12
E039.1	9/3/18 13:26	WT_LAP-18-156075	UF	Estimated	200	12
E039.1	9/3/18 13:26	WT_LAP-18-155955	F	Estimated	200	12
E039.1	9/3/18 13:26	WT_LAP-18-156015	F	Estimated	200	12
E039.1	9/3/18 13:27	WT_LAP-18-156618	UF	SSC	200	11
E039.1	9/3/18 13:29	WT_LAP-18-156619	UF	SSC	200	10
E039.1	9/3/18 13:30	WT_LAP-18-155775	F	Estimated	200	9.4
E039.1	9/3/18 13:31	WT_LAP-18-156620	UF	SSC	200	9
E039.1	9/3/18 13:32	WT_LAP-18-157023	UF	Estimated	150	8.6
E039.1	9/3/18 13:33	WT_LAP-18-156621	UF	SSC	100	8.3
E039.1	9/3/18 13:34	WT_LAP-18-156957	UF	Estimated	100	7.9
E039.1	9/3/18 13:35	WT_LAP-18-156622	UF	SSC	100	7.5
E039.1	9/3/18 13:36	WT_LAP-18-156847	UF	Estimated	150	7.3
E039.1	9/3/18 13:36	WT_LAP-18-156909	UF	Estimated	150	7.3
E039.1	9/3/18 13:37	WT_LAP-18-156623	UF	SSC	200	7

Table 4.2-1 (continued)

Station	Sample Collection Date and Time	Field Sample ID	Field Prep	SSC Source[a]	Calculated SSC (mg/L)	Calculated Instantaneous Discharge (cfs)
E039.1	9/3/18 13:39	WT_LAP-18-156624	UF	SSC	100	6.5
E039.1	9/3/18 13:40	WT_LAP-18-155895	UF	SSC	200	6.2
E039.1	9/3/18 13:41	WT_LAP-18-156625	UF	SSC	100	6
E039.1	9/3/18 13:43	WT_LAP-18-156626	UF	SSC	100	5.6
E039.1	9/3/18 13:45	WT_LAP-18-156627	UF	SSC	100	5.2
E039.1	9/3/18 13:47	WT_LAP-18-156628	UF	SSC	100	4.9
E039.1	9/4/18 13:22	WT_LAP-18-161783	UF	SSC	1100	67
E039.1	9/4/18 13:24	WT_LAP-18-161784	UF	SSC	1000	72
E039.1	9/4/18 13:26	WT_LAP-18-161785	UF	SSC	900	73
E039.1	9/4/18 13:28	WT_LAP-18-161786	UF	SSC	800	70
E039.1	9/4/18 13:30	WT_LAP-18-161787	UF	SSC	700	66
E039.1	9/4/18 13:32	WT_LAP-18-161788	UF	SSC	700	64
E039.1	9/4/18 13:32	WT_LAP-18-161664	UF	SSC	700	64
E039.1	9/4/18 13:34	WT_LAP-18-161789	UF	SSC	600	62
E039.1	9/4/18 13:34	WT_LAP-18-161672	UF	Estimated	600	62
E039.1	9/4/18 13:36	WT_LAP-18-161790	UF	SSC	600	59
E039.1	9/4/18 13:36	WT_LAP-18-161712	UF	Estimated	600	59
E039.1	9/4/18 13:36	WT_LAP-18-161752	UF	Estimated	600	59
E039.1	9/4/18 13:36	WT_LAP-18-161744	F	Estimated	600	59
E039.1	9/4/18 13:36	WT_LAP-18-161736	F	Estimated	600	59
E039.1	9/4/18 13:38	WT_LAP-18-161791	UF	SSC	600	56
E039.1	9/4/18 13:40	WT_LAP-18-161792	UF	SSC	500	53
E039.1	9/4/18 13:40	WT_LAP-18-161704	F	Estimated	500	53
E039.1	9/4/18 13:42	WT_LAP-18-161793	UF	SSC	500	49
E039.1	9/4/18 13:42	WT_LAP-18-161720	UF	Estimated	500	49
E039.1	9/4/18 13:44	WT_LAP-18-161794	UF	SSC	500	46
E039.1	9/4/18 13:44	WT_LAP-18-161696	UF	Estimated	500	46
E039.1	9/4/18 13:46	WT_LAP-18-161795	UF	SSC	500	42
E039.1	9/4/18 13:46	WT_LAP-18-161680	UF	Estimated	500	42
E039.1	9/4/18 13:46	WT_LAP-18-161688	UF	Estimated	500	42
E039.1	9/4/18 13:48	WT_LAP-18-161796	UF	SSC	400	38
E039.1	9/4/18 13:50	WT_LAP-18-161797	UF	SSC	400	35
E039.1	9/4/18 13:50	WT_LAP-18-161728	UF	SSC	400	35
E039.1	9/4/18 13:52	WT_LAP-18-161798	UF	SSC	400	32

Table 4.2-1 (continued)

Station	Sample Collection Date and Time	Field Sample ID	Field Prep	SSC Source[a]	Calculated SSC (mg/L)	Calculated Instantaneous Discharge (cfs)
E039.1	9/4/18 14:12	WT_LAP-18-161799	UF	SSC	200	14
E039.1	9/4/18 14:32	WT_LAP-18-161800	UF	SSC	200	5.5
E039.1	9/4/18 14:52	WT_LAP-18-161801	UF	SSC	200	3.6
E040	8/10/18 17:28	WT_LAP-18-155608	UF	SSC	2600	16
E040	8/10/18 17:30	WT_LAP-18-155668	UF	Estimated	2500	15
E040	8/10/18 17:32	WT_LAP-18-155788	UF	Estimated	2400	14
E040	8/10/18 17:32	WT_LAP-18-156028	UF	Estimated	2400	14
E040	8/10/18 17:32	WT_LAP-18-155908	F	Estimated	2400	14
E040	8/10/18 17:32	WT_LAP-18-155968	F	Estimated	2400	14
E040	8/10/18 17:36	WT_LAP-18-155728	F	Estimated	2100	12
E040	8/10/18 17:38	WT_LAP-18-156976	UF	Estimated	2000	11
E040	8/10/18 17:40	WT_LAP-18-156925	UF	Estimated	1900	10
E040	8/10/18 17:42	WT_LAP-18-156800	UF	Estimated	1700	9.7
E040	8/10/18 17:42	WT_LAP-18-156877	UF	Estimated	1700	9.7
E040	8/10/18 17:46	WT_LAP-18-155848	UF	SSC	1500	8.3
E040	9/4/18 14:03	WT_LAP-18-155623	UF	SSC	2600	67
E040	9/4/18 14:05	WT_LAP-18-155683	UF	Estimated	2600	63
E040	9/4/18 14:07	WT_LAP-18-155803	UF	Estimated	2600	58
E040	9/4/18 14:07	WT_LAP-18-156043	UF	Estimated	2600	58
E040	9/4/18 14:07	WT_LAP-18-155923	F	Estimated	2600	58
E040	9/4/18 14:07	WT_LAP-18-155983	F	Estimated	2600	58
E040	9/4/18 14:11	WT_LAP-18-155743	F	Estimated	2600	49
E040	9/4/18 14:13	WT_LAP-18-156991	UF	Estimated	2600	45
E040	9/4/18 14:15	WT_LAP-18-156935	UF	Estimated	2600	42
E040	9/4/18 14:17	WT_LAP-18-156815	UF	Estimated	2600	40
E040	9/4/18 14:17	WT_LAP-18-156887	UF	Estimated	2600	40
E040	9/4/18 14:21	WT_LAP-18-155863	UF	SSC	2600	37
E040	9/5/18 20:28	WT_LAP-18-155638	UF	SSC	600	15
E040	9/5/18 20:30	WT_LAP-18-155698	UF	Estimated	580	15
E040	9/5/18 20:32	WT_LAP-18-155818	UF	Estimated	560	15
E040	9/5/18 20:32	WT_LAP-18-156058	UF	Estimated	560	15
E040	9/5/18 20:32	WT_LAP-18-155938	F	Estimated	560	15
E040	9/5/18 20:32	WT_LAP-18-155998	F	Estimated	560	15
E040	9/5/18 20:36	WT_LAP-18-155758	F	Estimated	510	14

Table 4.2-1 (continued)

Station	Sample Collection Date and Time	Field Sample ID	Field Prep	SSC Source[a]	Calculated SSC (mg/L)	Calculated Instantaneous Discharge (cfs)
E040	9/5/18 20:38	WT_LAP-18-157006	UF	Estimated	490	14
E040	9/5/18 20:40	WT_LAP-18-156945	UF	Estimated	470	14
E040	9/5/18 20:42	WT_LAP-18-156830	UF	Estimated	440	14
E040	9/5/18 20:42	WT_LAP-18-156897	UF	Estimated	440	14
E040	9/5/18 20:46	WT_LAP-18-155878	UF	SSC	400	15
E040	10/23/18 17:39	WT_LAP-18-155653	UF	SSC	1000	17
E040	10/23/18 17:41	WT_LAP-18-155713	UF	Estimated	960	17
E040	10/23/18 17:43	WT_LAP-18-155833	UF	Estimated	910	16
E040	10/23/18 17:43	WT_LAP-18-155953	F	Estimated	910	16
E040	10/23/18 17:43	WT_LAP-18-156013	F	Estimated	910	16
E040	10/23/18 17:43	WT_LAP-18-156073	UF	Estimated	910	16
E040	10/23/18 17:47	WT_LAP-18-155773	F	Estimated	820	15
E040	10/23/18 17:49	WT_LAP-18-157021	UF	Estimated	780	14
E040	10/23/18 17:51	WT_LAP-18-156955	UF	Estimated	730	13
E040	10/23/18 17:53	WT_LAP-18-156845	UF	Estimated	690	13
E040	10/23/18 17:53	WT_LAP-18-156907	UF	Estimated	690	13
E040	10/23/18 17:57	WT_LAP-18-155893	UF	SSC	600	11
E042.1	9/4/18 15:03	WT_LAP-18-156181	UF	SSC	9300	8.4
E042.1	9/4/18 15:05	WT_LAP-18-156182	UF	SSC	8300	7
E042.1	9/4/18 15:07	WT_LAP-18-156183	UF	SSC	7300	6.6
E042.1	9/4/18 15:09	WT_LAP-18-156184	UF	SSC	6800	6.3
E042.1	9/4/18 15:11	WT_LAP-18-156185	UF	SSC	6100	6.2
E042.1	9/4/18 15:12	WT_LAP-18-155614	UF	SSC	5800	6.3
E042.1	9/4/18 15:13	WT_LAP-18-156186	UF	SSC	6100	6.3
E042.1	9/4/18 15:14	WT_LAP-18-155674	UF	Estimated	6000	6.4
E042.1	9/4/18 15:15	WT_LAP-18-156187	UF	SSC	5800	6.4
E042.1	9/4/18 15:16	WT_LAP-18-155974	F	Estimated	5700	6.3
E042.1	9/4/18 15:16	WT_LAP-18-155794	UF	Estimated	5700	6.3
E042.1	9/4/18 15:16	WT_LAP-18-155914	F	Estimated	5700	6.3
E042.1	9/4/18 15:16	WT_LAP-18-156034	UF	Estimated	5700	6.3
E042.1	9/4/18 15:17	WT_LAP-18-156188	UF	SSC	5600	6.1
E042.1	9/4/18 15:19	WT_LAP-18-156189	UF	SSC	5100	5.8
E042.1	9/4/18 15:20	WT_LAP-18-155734	F	Estimated	4900	5.6
E042.1	9/4/18 15:21	WT_LAP-18-157053	UF	Estimated	4800	5.5

Table 4.2-1 (continued)

Station	Sample Collection Date and Time	Field Sample ID	Field Prep	SSC Source[a]	Calculated SSC (mg/L)	Calculated Instantaneous Discharge (cfs)
E042.1	9/4/18 15:22	WT_LAP-18-156778	UF	Estimated	4600	5.4
E042.1	9/4/18 15:23	WT_LAP-18-156190	UF	SSC	4400	5.2
E042.1	9/4/18 15:24	WT_LAP-18-156931	UF	Estimated	4200	5.1
E042.1	9/4/18 15:25	WT_LAP-18-157057	UF	Estimated	4100	4.9
E042.1	9/4/18 15:26	WT_LAP-18-156806	UF	Estimated	4000	4.8
E042.1	9/4/18 15:27	WT_LAP-18-156191	UF	SSC	3800	4.6
E042.1	9/4/18 15:29	WT_LAP-18-156192	UF	SSC	3600	4.4
E042.1	9/4/18 15:30	WT_LAP-18-155854	UF	SSC	3500	4.2
E042.1	9/4/18 15:31	WT_LAP-18-156193	UF	SSC	3600	4
E042.1	9/4/18 15:33	WT_LAP-18-156194	UF	SSC	3400	3.6
E042.1	9/4/18 15:53	WT_LAP-18-156195	UF	SSC	2500	2.4
E042.1	9/4/18 16:02	WT_LAP-18-156759	UF	Estimated	2200	2.1
E042.1	9/4/18 16:04	WT_LAP-18-156883	UF	Estimated	2200	1.9
E042.1	9/4/18 16:13	WT_LAP-18-156196	UF	SSC	1900	1.3
E042.1	9/4/18 16:33	WT_LAP-18-156197	UF	SSC	1200	1.1
E042.1	9/4/18 16:53	WT_LAP-18-156198	UF	SSC	900	0.34
E042.1	9/4/18 17:13	WT_LAP-18-156199	UF	SSC	700	0
E042.1	9/4/18 17:33	WT_LAP-18-156200	UF	SSC	500	0.38
E055	8/9/18 18:00	WT_LAP-18-155617	UF	SSC	1800	11
E055	8/9/18 18:02	WT_LAP-18-155677	UF	Estimated	1800	10
E055	8/9/18 18:04	WT_LAP-18-156037	UF	Estimated	1700	9.3
E055	8/9/18 18:04	WT_LAP-18-155797	UF	Estimated	1700	9.3
E055	8/9/18 18:04	WT_LAP-18-155917	F	Estimated	1700	9.3
E055	8/9/18 18:04	WT_LAP-18-155977	F	Estimated	1700	9.3
E055	8/9/18 18:08	WT_LAP-18-155737	F	Estimated	1600	8.2
E055	8/9/18 18:10	WT_LAP-18-156985	UF	Estimated	1600	7.6
E055	8/9/18 18:10	WT_LAP-18-157036	UF	Estimated	1600	7.6
E055	8/9/18 18:12	WT_LAP-18-156860	UF	Estimated	1500	7.1
E055	8/9/18 18:14	WT_LAP-18-156809	UF	Estimated	1500	6.7
E055	8/9/18 18:18	WT_LAP-18-155857	UF	SSC	1400	5.9
E055	8/9/18 18:18	WT_LAP-18-155857	UF	SSC	1300	5.9
E055.5	8/2/18 18:54	WT_LAP-18-155619	UF	SSC	2000	0.342
E055.5	8/2/18 18:57	WT_LAP-18-155679	UF	Estimated	1800	0.284
E055.5	8/2/18 19:00	WT_LAP-18-156039	UF	Estimated	1600	0.26

Table 4.2-1 (continued)

Station	Sample Collection Date and Time	Field Sample ID	Field Prep	SSC Source[a]	Calculated SSC (mg/L)	Calculated Instantaneous Discharge (cfs)
E055.5	8/2/18 19:00	WT_LAP-18-155799	UF	Estimated	1600	0.26
E055.5	8/2/18 19:00	WT_LAP-18-155919	F	Estimated	1600	0.26
E055.5	8/2/18 19:00	WT_LAP-18-155979	F	Estimated	1600	0.26
E055.5	8/2/18 19:04	WT_LAP-18-155739	F	Estimated	1400	0.412
E055.5	8/2/18 19:07	WT_LAP-18-156987	UF	Estimated	1200	0.414
E055.5	8/2/18 19:07	WT_LAP-18-157037	UF	Estimated	1200	0.414
E055.5	8/2/18 19:09	WT_LAP-18-156861	UF	Estimated	1110	0.378
E055.5	8/2/18 19:11	WT_LAP-18-156811	UF	Estimated	1000	0.344
E055.5	8/2/18 19:16	WT_LAP-18-155859	UF	SSC	700	0.312
E055.5	8/2/18 19:16	WT_LAP-18-155859	UF	SSC	400	0.312
E055.5	9/3/18 12:28	WT_LAP-18-155634	UF	SSC	2000	0.36
E055.5	9/3/18 12:31	WT_LAP-18-155694	UF	Estimated	1700	0.33
E055.5	9/3/18 12:33	WT_LAP-18-156054	UF	Estimated	1600	0.42
E055.5	9/3/18 12:33	WT_LAP-18-155814	UF	Estimated	1600	0.42
E055.5	9/3/18 12:33	WT_LAP-18-155934	F	Estimated	1600	0.42
E055.5	9/3/18 12:33	WT_LAP-18-155994	F	Estimated	1600	0.42
E055.5	9/3/18 12:38	WT_LAP-18-155754	F	Estimated	1100	0.47
E055.5	9/3/18 12:40	WT_LAP-18-157002	UF	Estimated	970	0.44
E055.5	9/3/18 12:40	WT_LAP-18-157042	UF	Estimated	970	0.44
E055.5	9/3/18 12:42	WT_LAP-18-156866	UF	Estimated	800	0.41
E055.5	9/3/18 12:44	WT_LAP-18-156826	UF	Estimated	630	0.38
E055.5	9/3/18 12:49	WT_LAP-18-155874	UF	SSC	200	0.32
E056	7/13/18 13:49	WT_LAP-18-155620	UF	SSC	7300	1.8
E056	7/13/18 13:51	WT_LAP-18-155680	UF	Estimated	6600	1.6
E056	7/13/18 13:53	WT_LAP-18-155980	F	Estimated	6000	1.4
E056	7/13/18 13:53	WT_LAP-18-155800	UF	Estimated	6000	1.4
E056	7/13/18 13:53	WT_LAP-18-155920	F	Estimated	6000	1.4
E056	7/13/18 13:53	WT_LAP-18-156040	UF	Estimated	6000	1.4
E056	7/13/18 13:57	WT_LAP-18-155740	F	Estimated	4600	1.1
E056	7/13/18 13:59	WT_LAP-18-156988	UF	Estimated	4000	0.97
E056	7/13/18 13:59	WT_LAP-18-157038	UF	Estimated	4000	0.97
E056	7/13/18 14:01	WT_LAP-18-156862	UF	Estimated	3300	0.89
E056	7/13/18 14:03	WT_LAP-18-156812	UF	Estimated	2600	0.82
E056	7/13/18 14:07	WT_LAP-18-155860	UF	SSC	1300	0.71

Table 4.2-1 (continued)

Station	Sample Collection Date and Time	Field Sample ID	Field Prep	SSC Source[a]	Calculated SSC (mg/L)	Calculated Instantaneous Discharge (cfs)
E056	7/13/18 14:07	WT_LAP-18-155860	UF	SSC	1000	0.71
E056	7/17/18 11:54	WT_LAP-18-155635	UF	SSC	1100	2.9
E056	7/17/18 11:56	WT_LAP-18-155695	UF	Estimated	1000	2.8
E056	7/17/18 11:58	WT_LAP-18-155815	UF	Estimated	990	2.7
E056	7/17/18 11:58	WT_LAP-18-155935	F	Estimated	990	2.7
E056	7/17/18 11:58	WT_LAP-18-155995	F	Estimated	990	2.7
E056	7/17/18 11:58	WT_LAP-18-156055	UF	Estimated	990	2.7
E056	7/17/18 12:02	WT_LAP-18-155755	F	Estimated	880	2.8
E056	7/17/18 12:04	WT_LAP-18-157003	UF	Estimated	820	2.9
E056	7/17/18 12:04	WT_LAP-18-157043	UF	Estimated	820	2.9
E056	7/17/18 12:06	WT_LAP-18-156867	UF	Estimated	770	2.9
E056	7/17/18 12:08	WT_LAP-18-156827	UF	Estimated	710	2.7
E056	7/17/18 12:12	WT_LAP-18-155875	UF	SSC	600	2.3
E056	7/17/18 12:12	WT_LAP-18-155875	UF	SSC	700	2.3
E056	7/17/18 12:12	WT_LAP-18-155875	UF	SSC	800	2.3
E056	8/9/18 17:45	WT_LAP-18-155650	UF	SSC	700	3.1
E056	8/9/18 17:47	WT_LAP-18-155710	UF	Estimated	670	3.1
E056	8/9/18 17:49	WT_LAP-18-155830	UF	Estimated	630	3
E056	8/9/18 17:49	WT_LAP-18-155950	F	Estimated	630	3
E056	8/9/18 17:49	WT_LAP-18-156010	F	Estimated	630	3
E056	8/9/18 17:49	WT_LAP-18-156070	UF	Estimated	630	3
E056	8/9/18 17:53	WT_LAP-18-155770	F	Estimated	570	2.9
E056	8/9/18 17:55	WT_LAP-18-157018	UF	Estimated	530	2.8
E056	8/9/18 17:55	WT_LAP-18-157048	UF	Estimated	530	2.8
E056	8/9/18 17:57	WT_LAP-18-156872	UF	Estimated	500	2.7
E056	8/9/18 17:59	WT_LAP-18-156842	UF	Estimated	470	2.6
E056	8/9/18 18:03	WT_LAP-18-155890	UF	SSC	400	2.2
E056	8/9/18 18:03	WT_LAP-18-155890	UF	SSC	300	2.2
E056	9/4/18 13:30	WT_LAP-18-160850	UF	SSC	2300	2.4
E056	9/4/18 13:32	WT_LAP-18-160852	UF	Estimated	2600	2.3
E056	9/4/18 13:34	WT_LAP-18-160856	UF	Estimated	2900	2.2
E056	9/4/18 13:34	WT_LAP-18-160853	UF	Estimated	2900	2.2
E056	9/4/18 13:34	WT_LAP-18-160854	F	Estimated	2900	2.2
E056	9/4/18 13:34	WT_LAP-18-160855	F	Estimated	2900	2.2

Table 4.2-1 (continued)

Station	Sample Collection Date and Time	Field Sample ID	Field Prep	SSC Source[a]	Calculated SSC (mg/L)	Calculated Instantaneous Discharge (cfs)
E056	9/4/18 13:38	WT_LAP-18-160857	F	Estimated	3500	1.9
E056	9/4/18 13:40	WT_LAP-18-160858	UF	Estimated	3800	1.7
E056	9/4/18 13:40	WT_LAP-18-160859	UF	Estimated	3800	1.7
E056	9/4/18 13:42	WT_LAP-18-160860	UF	Estimated	4100	1.7
E056	9/4/18 13:44	WT_LAP-18-160861	UF	Estimated	4400	1.6
E056	9/4/18 13:48	WT_LAP-18-160851	UF	SSC	5000	1.3

[a] SSC = Measured using ASTM method D3977-97.

[b] UF = Unfiltered.

[c] n/a = Not applicable.

[d] F = Filtered.

Table 4.3-1
Calculated Total Metal and Isotopic Uranium Concentrations Determined for each Sample Analyzed for SSC during 2018 in the LA/P Watershed

Station	Sample Collection Date and Time	Field Sample ID	Measured SSC (mg/L)	Estimated Total Recoverable Metals Concentrations and Unfiltered Isotopic Uranium Activities																			
				Ag (µg/L) 0.499 + 0.0000237a * SSCb	Al (µg/L) 19,895 + 3.59 * SSC	As (µg/L) 6.79 + 0.000663 * SSC	Ba (µg/L) −117 + 0.16 * SSC	Be (µg/L) 2.57 + 0.000673 * SSC	Cd (µg/L) 0.751 + 0.000254 * SSC	Cr (µg/L) 24 + 0.00255 * SSC	Cu (µg/L) 47.3 + 0.00322 * SSC	Fe (µg/L) 3489 + 5.99 * SSC	Hg (µg/L) 0.307 + 0.0000218 * SSC	Mn (µg/L) −12,962 + 2.51 * SSC	Ni (µg/L) 19.3 + 0.00344 * SSC	Pb (µg/L) 107 + 0.00864 * SSC	Se (µg/L) 4.66 + 0.000136 * SSC	Tl (µg/L) 0.621 + 0.000116 * SSC	U-234 (pCi/L) −0.856 + 0.00078c * SSC	U-235/236 (pCi/L) −0.131 + 0.0000474 * SSC	U-238 (pCi/L) −1.33 + 0.000802 * SSC	V (µg/L) 25.4 + 0.00739 * SSC	Zn (µg/L) −53.3 + 0.0788 * SSC
Sediment Background Value (mg/kg)				1	15400	3.98	127	1.31	0.4	10.5	11.2	13800	0.1	543	9.38	19.7	0.3	0.73	2.59	0.2	2.29	19.7	60.2
CO111041	7/13/18 13:41	WT_LAP-18-155607	700	0.516	22400	7.25	-5	3.04	0.929	25.8	49.6	7680	0.322	-11200	21.7	113	4.76	0.702	-0.31	-0.0978	-0.769	30.6	1.86
CO111041	7/13/18 13:39	WT_LAP-18-155847	200	0.504	20600	6.92	-85	2.7	0.802	24.5	47.9	4690	0.311	-12500	20	109	4.69	0.644	-0.7	-0.122	-1.17	26.9	-37.5
E038	8/2/18 18:54	WT_LAP-18-156085	2300	0.554	28200	8.31	251	4.12	1.34	29.9	54.7	17300	0.357	-7190	27.2	127	4.97	0.888	0.938	-0.022	0.515	42.4	128
E038	8/2/18 18:57	WT_LAP-18-156086	2000	0.546	27100	8.12	203	3.92	1.26	29.1	53.7	15500	0.351	-7940	26.2	124	4.93	0.853	0.704	-0.0362	0.274	40.2	104
E038	8/2/18 18:59	WT_LAP-18-156087	1500	0.535	25300	7.78	123	3.58	1.13	27.8	52.1	12500	0.34	-9200	24.5	120	4.86	0.795	0.314	-0.0599	-0.127	36.5	64.9
E038	8/2/18 19:01	WT_LAP-18-156088	1300	0.53	24600	7.65	91	3.44	1.08	27.3	51.5	11300	0.335	-9700	23.8	118	4.84	0.772	0.158	-0.0694	-0.287	35	49.1
E038	8/2/18 19:03	WT_LAP-18-156089	1200	0.527	24200	7.59	75	3.38	1.06	27.1	51.2	10700	0.333	-9950	23.4	117	4.82	0.76	0.08	-0.0741	-0.368	34.3	41.3
E038	8/2/18 19:05	WT_LAP-18-155609	1200	0.527	24200	7.59	75	3.38	1.06	27.1	51.2	10700	0.333	-9950	23.4	117	4.82	0.76	0.08	-0.0741	-0.368	34.3	41.3
E038	8/2/18 19:06	WT_LAP-18-156090	1300	0.53	24600	7.65	91	3.44	1.08	27.3	51.5	11300	0.335	-9700	23.8	118	4.84	0.772	0.158	-0.0694	-0.287	35	49.1
E038	8/2/18 19:08	WT_LAP-18-156091	1100	0.525	23800	7.52	59	3.31	1.03	26.8	50.8	10100	0.331	-10200	23.1	117	4.81	0.749	0.002	-0.0789	-0.448	33.5	33.4
E038	8/2/18 19:10	WT_LAP-18-156092	1100	0.525	23800	7.52	59	3.31	1.03	26.8	50.8	10100	0.331	-10200	23.1	117	4.81	0.749	0.002	-0.0789	-0.448	33.5	33.4
E038	8/2/18 19:13	WT_LAP-18-156093	1000	0.523	23500	7.45	43	3.24	1	26.6	50.5	9480	0.329	-10500	22.7	116	4.8	0.737	-0.076	-0.0836	-0.528	32.8	25.5
E038	8/2/18 19:15	WT_LAP-18-156094	900	0.52	23100	7.39	27	3.18	0.98	26.3	50.2	8880	0.327	-10700	22.4	115	4.78	0.725	-0.154	-0.0883	-0.608	32.1	17.6
E038	8/2/18 19:17	WT_LAP-18-156095	700	0.516	22400	7.25	-5	3.04	0.929	25.8	49.6	7680	0.322	-11200	21.7	113	4.76	0.702	-0.31	-0.0978	-0.769	30.6	1.86
E038	8/2/18 19:20	WT_LAP-18-156096	600	0.513	22000	7.19	-21	2.97	0.903	25.5	49.2	7080	0.32	-11500	21.4	112	4.74	0.691	-0.388	-0.103	-0.849	29.8	-6.02
E038	8/2/18 19:23	WT_LAP-18-155849	400	0.508	21300	7.06	-53	2.84	0.853	25	48.6	5880	0.316	-12000	20.7	110	4.71	0.667	-0.544	-0.112	-1.01	28.4	-21.8
E038	8/2/18 19:23	WT_LAP-18-155849	500	0.511	21700	7.12	-37	2.91	0.878	25.3	48.9	6480	0.318	-11700	21	111	4.73	0.679	-0.466	-0.107	-0.929	29.1	-13.9
E038	8/2/18 19:24	WT_LAP-18-156100	400	0.508	21300	7.06	-53	2.84	0.853	25	48.6	5880	0.316	-12000	20.7	110	4.71	0.667	-0.544	-0.112	-1.01	28.4	-21.8
E038	8/2/18 19:44	WT_LAP-18-156101	200	0.504	20600	6.92	-85	2.7	0.802	24.5	47.9	4690	0.311	-12500	20	109	4.69	0.644	-0.7	-0.122	-1.17	26.9	-37.5
E038	8/2/18 20:04	WT_LAP-18-156102	100	0.501	20300	6.86	-101	2.64	0.776	24.3	47.6	4090	0.309	-12700	19.6	108	4.67	0.633	-0.778	-0.126	-1.25	26.1	-45.4
E038	8/10/18 16:10	WT_LAP-18-156253	3500	0.582	32500	9.11	443	4.93	1.64	32.9	58.6	24500	0.383	-4180	31.3	137	5.14	1.03	1.87	0.0349	1.48	51.3	222
E038	8/10/18 16:12	WT_LAP-18-156254	3100	0.572	31000	8.85	379	4.66	1.54	31.9	57.3	22100	0.375	-5180	30	134	5.08	0.981	1.56	0.0159	1.16	48.3	191
E038	8/10/18 16:14	WT_LAP-18-156255	2500	0.558	28900	8.45	283	4.25	1.39	30.4	55.4	18500	0.362	-6690	27.9	129	5	0.911	1.09	-0.0125	0.675	43.9	144

Table 4.3-1 (continued)

Station	Sample Collection Date and Time	Field Sample ID	Measured SSC (mg/L)	Estimated Total Recoverable Metals Concentrations and Unfiltered Isotopic Uranium Activities																			
				Ag (µg/L) 0.499 + 0.0000237a * SSCb	Al (µg/L) 19.895 + 3.59 * SSC	As (µg/L) 6.79 + 0.000663 * SSC	Ba (µg/L) −117 + 0.16 * SSC	Be (µg/L) 2.57 + 0.000673 * SSC	Cd (µg/L) 0.751 + 0.000254 * SSC	Cr (µg/L) 24 + 0.00255 * SSC	Cu (µg/L) 47.3 + 0.00322 * SSC	Fe (µg/L) 3489 + 5.99 * SSC	Hg (µg/L) 0.307 + 0.0000218 * SSC	Mn (µg/L) −12,962 + 2.51 * SSC	Ni (µg/L) 19.3 + 0.00344 * SSC	Pb (µg/L) 107 + 0.00864 * SSC	Se (µg/L) 4.66 + 0.000136 * SSC	Tl (µg/L) 0.621 + 0.000116 * SSC	U-234 (pCi/L) −0.856 + 0.00078c * SSC	U-235/236 (pCi/L) −0.131 + 0.0000474 * SSC	U-238 (pCi/L) −1.33 + 0.000802 * SSC	V (µg/L) 25.4 + 0.00739 * SSC	Zn (µg/L) −53.3 + 0.0788 * SSC
Sediment Background Value (mg/kg)				1	15400	3.98	127	1.31	0.4	10.5	11.2	13800	0.1	543	9.38	19.7	0.3	0.73	2.59	0.2	2.29	19.7	60.2
E038	8/10/18 16:16	WT_LAP-18-156256	2100	0.549	27400	8.18	219	3.98	1.28	29.4	54.1	16100	0.353	-7690	26.5	125	4.95	0.865	0.782	-0.0315	0.354	40.9	112
E038	8/10/18 16:19	WT_LAP-18-156257	1700	0.539	26000	7.92	155	3.71	1.18	28.3	52.8	13700	0.344	-8700	25.1	122	4.89	0.818	0.47	-0.0504	0.0334	38	80.7
E038	8/10/18 16:20	WT_LAP-18-155624	1500	0.535	25300	7.78	123	3.58	1.13	27.8	52.1	12500	0.34	-9200	24.5	120	4.86	0.795	0.314	-0.0599	-0.127	36.5	64.9
E038	8/10/18 16:21	WT_LAP-18-156258	1500	0.535	25300	7.78	123	3.58	1.13	27.8	52.1	12500	0.34	-9200	24.5	120	4.86	0.795	0.314	-0.0599	-0.127	36.5	64.9
E038	8/10/18 16:23	WT_LAP-18-156259	1400	0.532	24900	7.72	107	3.51	1.11	27.6	51.8	11900	0.338	-9450	24.1	119	4.85	0.783	0.236	-0.0646	-0.207	35.7	57
E038	8/10/18 16:25	WT_LAP-18-156260	1800	0.542	26400	7.98	171	3.78	1.21	28.6	53.1	14300	0.346	-8440	25.5	123	4.9	0.83	0.548	-0.0457	0.114	38.7	88.5
E038	8/10/18 16:28	WT_LAP-18-156261	1200	0.527	24200	7.59	75	3.38	1.06	27.1	51.2	10700	0.333	-9950	23.4	117	4.82	0.76	0.08	-0.0741	-0.368	34.3	41.3
E038	8/10/18 16:30	WT_LAP-18-156262	1300	0.53	24600	7.65	91	3.44	1.08	27.3	51.5	11300	0.335	-9700	23.8	118	4.84	0.772	0.158	-0.0694	-0.287	35	49.1
E038	8/10/18 16:32	WT_LAP-18-156263	900	0.52	23100	7.39	27	3.18	0.98	26.3	50.2	8880	0.327	-10700	22.4	115	4.78	0.725	-0.154	-0.0883	-0.608	32.1	17.6
E038	8/10/18 16:35	WT_LAP-18-156264	700	0.516	22400	7.25	-5	3.04	0.929	25.8	49.6	7680	0.322	-11200	21.7	113	4.76	0.702	-0.31	-0.0978	-0.769	30.6	1.86
E038	8/10/18 16:37	WT_LAP-18-156265	700	0.516	22400	7.25	-5	3.04	0.929	25.8	49.6	7680	0.322	-11200	21.7	113	4.76	0.702	-0.31	-0.0978	-0.769	30.6	1.86
E038	8/10/18 16:40	WT_LAP-18-155864	700	0.516	22400	7.25	-5	3.04	0.929	25.8	49.6	7680	0.322	-11200	21.7	113	4.76	0.702	-0.31	-0.0978	-0.769	30.6	1.86
E038	8/10/18 16:40	WT_LAP-18-156268	600	0.513	22000	7.19	-21	2.97	0.903	25.5	49.2	7080	0.32	-11500	21.4	112	4.74	0.691	-0.388	-0.103	-0.849	29.8	-6.02
E038	8/10/18 17:00	WT_LAP-18-156269	200	0.504	20600	6.92	-85	2.7	0.802	24.5	47.9	4690	0.311	-12500	20	109	4.69	0.644	-0.7	-0.122	-1.17	26.9	-37.5
E038	8/10/18 17:20	WT_LAP-18-156270	100	0.501	20300	6.86	-101	2.64	0.776	24.3	47.6	4090	0.309	-12700	19.6	108	4.67	0.633	-0.778	-0.126	-1.25	26.1	-45.4
E038	8/15/18 12:59	WT_LAP-18-156421	3000	0.57	30700	8.78	363	4.59	1.51	31.6	57	21500	0.372	-5430	29.6	133	5.07	0.969	1.48	0.0112	1.08	47.6	183
E038	8/15/18 13:02	WT_LAP-18-156422	2300	0.554	28200	8.31	251	4.12	1.34	29.9	54.7	17300	0.357	-7190	27.2	127	4.97	0.888	0.938	-0.022	0.515	42.4	128
E038	8/15/18 13:04	WT_LAP-18-156423	1800	0.542	26400	7.98	171	3.78	1.21	28.6	53.1	14300	0.346	-8440	25.5	123	4.9	0.83	0.548	-0.0457	0.114	38.7	88.5
E038	8/15/18 13:06	WT_LAP-18-156424	1800	0.542	26400	7.98	171	3.78	1.21	28.6	53.1	14300	0.346	-8440	25.5	123	4.9	0.83	0.548	-0.0457	0.114	38.7	88.5
E038	8/15/18 13:08	WT_LAP-18-156425	1700	0.539	26000	7.92	155	3.71	1.18	28.3	52.8	13700	0.344	-8700	25.1	122	4.89	0.818	0.47	-0.0504	0.0334	38	80.7
E038	8/15/18 13:09	WT_LAP-18-156426	1500	0.535	25300	7.78	123	3.58	1.13	27.8	52.1	12500	0.34	-9200	24.5	120	4.86	0.795	0.314	-0.0599	-0.127	36.5	64.9
E038	8/15/18 13:10	WT_LAP-18-155639	1400	0.532	24900	7.72	107	3.51	1.11	27.6	51.8	11900	0.338	-9450	24.1	119	4.85	0.783	0.236	-0.0646	-0.207	35.7	57
E038	8/15/18 13:11	WT_LAP-18-156427	1500	0.535	25300	7.78	123	3.58	1.13	27.8	52.1	12500	0.34	-9200	24.5	120	4.86	0.795	0.314	-0.0599	-0.127	36.5	64.9
E038	8/15/18 13:13	WT_LAP-18-156428	1500	0.535	25300	7.78	123	3.58	1.13	27.8	52.1	12500	0.34	-9200	24.5	120	4.86	0.795	0.314	-0.0599	-0.127	36.5	64.9
E038	8/15/18 13:15	WT_LAP-18-156429	1300	0.53	24600	7.65	91	3.44	1.08	27.3	51.5	11300	0.335	-9700	23.8	118	4.84	0.772	0.158	-0.0694	-0.287	35	49.1
E038	8/15/18 13:17	WT_LAP-18-156430	1100	0.525	23800	7.52	59	3.31	1.03	26.8	50.8	10100	0.331	-10200	23.1	117	4.81	0.749	0.002	-0.0789	-0.448	33.5	33.4
E038	8/15/18 13:19	WT_LAP-18-156431	1300	0.53	24600	7.65	91	3.44	1.08	27.3	51.5	11300	0.335	-9700	23.8	118	4.84	0.772	0.158	-0.0694	-0.287	35	49.1
E038	8/15/18 13:21	WT_LAP-18-156432	1100	0.525	23800	7.52	59	3.31	1.03	26.8	50.8	10100	0.331	-10200	23.1	117	4.81	0.749	0.002	-0.0789	-0.448	33.5	33.4

Table 4.3-1 (continued)

Station	Sample Collection Date and Time	Field Sample ID	Measured SSC (mg/L)	Estimated Total Recoverable Metals Concentrations and Unfiltered Isotopic Uranium Activities																			
				Ag (µg/L) 0.499 + 0.0000237a * SSCb	Al (µg/L) 19.895 + 3.59 * SSC	As (µg/L) 6.79 + 0.000663 * SSC	Ba (µg/L) –117 + 0.16 * SSC	Be (µg/L) 2.57 + 0.000673 * SSC	Cd (µg/L) 0.751 + 0.000254 * SSC	Cr (µg/L) 24 + 0.00255 * SSC	Cu (µg/L) 47.3 + 0.00322 * SSC	Fe (µg/L) 3489 + 5.99 * SSC	Hg (µg/L) 0.307 + 0.0000218 * SSC	Mn (µg/L) –12,962 + 2.51 * SSC	Ni (µg/L) 19.3 + 0.00344 * SSC	Pb (µg/L) 107 + 0.00864 * SSC	Se (µg/L) 4.66 + 0.000136 * SSC	Tl (µg/L) 0.621 + 0.000116 * SSC	U-234 (pCi/L) –0.856 + 0.00078c * SSC	U-235/236 (pCi/L) –0.131 + 0.0000474 * SSC	U-238 (pCi/L) –1.33 + 0.000802 * SSC	V (µg/L) 25.4 + 0.00739 * SSC	Zn (µg/L) –53.3 + 0.0788 * SSC
Sediment Background Value (mg/kg)				1	15400	3.98	127	1.31	0.4	10.5	11.2	13800	0.1	543	9.38	19.7	0.3	0.73	2.59	0.2	2.29	19.7	60.2
E038	8/15/18 13:24	WT_LAP-18-156433	1000	0.523	23500	7.45	43	3.24	1	26.6	50.5	9480	0.329	-10500	22.7	116	4.8	0.737	-0.076	-0.0836	-0.528	32.8	25.5
E038	8/15/18 13:26	WT_LAP-18-156434	800	0.518	22800	7.32	11	3.11	0.954	26	49.9	8280	0.324	-11000	22.1	114	4.77	0.714	-0.232	-0.0931	-0.688	31.3	9.74
E038	8/15/18 13:29	WT_LAP-18-156436	700	0.516	22400	7.25	-5	3.04	0.929	25.8	49.6	7680	0.322	-11200	21.7	113	4.76	0.702	-0.31	-0.0978	-0.769	30.6	1.86
E038	8/15/18 13:30	WT_LAP-18-155879	700	0.516	22400	7.25	-5	3.04	0.929	25.8	49.6	7680	0.322	-11200	21.7	113	4.76	0.702	-0.31	-0.0978	-0.769	30.6	1.86
E038	8/15/18 13:49	WT_LAP-18-156437	400	0.508	21300	7.06	-53	2.84	0.853	25	48.6	5880	0.316	-12000	20.7	110	4.71	0.667	-0.544	-0.112	-1.01	28.4	-21.8
E038	8/15/18 14:09	WT_LAP-18-156438	200	0.504	20600	6.92	-85	2.7	0.802	24.5	47.9	4690	0.311	-12500	20	109	4.69	0.644	-0.7	-0.122	-1.17	26.9	-37.5
E038	9/3/18 12:29	WT_LAP-18-156589	2100	0.549	27400	8.18	219	3.98	1.28	29.4	54.1	16100	0.353	-7690	26.5	125	4.95	0.865	0.782	-0.0315	0.354	40.9	112
E038	9/3/18 12:31	WT_LAP-18-156590	1700	0.539	26000	7.92	155	3.71	1.18	28.3	52.8	13700	0.344	-8700	25.1	122	4.89	0.818	0.47	-0.0504	0.0334	38	80.7
E038	9/3/18 12:33	WT_LAP-18-156591	1500	0.535	25300	7.78	123	3.58	1.13	27.8	52.1	12500	0.34	-9200	24.5	120	4.86	0.795	0.314	-0.0599	-0.127	36.5	64.9
E038	9/3/18 12:35	WT_LAP-18-156592	1500	0.535	25300	7.78	123	3.58	1.13	27.8	52.1	12500	0.34	-9200	24.5	120	4.86	0.795	0.314	-0.0599	-0.127	36.5	64.9
E038	9/3/18 12:37	WT_LAP-18-156593	1600	0.537	25600	7.85	139	3.65	1.16	28.1	52.5	13100	0.342	-8950	24.8	121	4.88	0.807	0.392	-0.0552	-0.0468	37.2	72.8
E038	9/3/18 12:39	WT_LAP-18-156594	1800	0.542	26400	7.98	171	3.78	1.21	28.6	53.1	14300	0.346	-8440	25.5	123	4.9	0.83	0.548	-0.0457	0.114	38.7	88.5
E038	9/3/18 12:40	WT_LAP-18-155654	1600	0.537	25600	7.85	139	3.65	1.16	28.1	52.5	13100	0.342	-8950	24.8	121	4.88	0.807	0.392	-0.0552	-0.0468	37.2	72.8
E038	9/3/18 12:41	WT_LAP-18-156595	1600	0.537	25600	7.85	139	3.65	1.16	28.1	52.5	13100	0.342	-8950	24.8	121	4.88	0.807	0.392	-0.0552	-0.0468	37.2	72.8
E038	9/3/18 12:43	WT_LAP-18-156596	1400	0.532	24900	7.72	107	3.51	1.11	27.6	51.8	11900	0.338	-9450	24.1	119	4.85	0.783	0.236	-0.0646	-0.207	35.7	57
E038	9/3/18 12:45	WT_LAP-18-156597	1100	0.525	23800	7.52	59	3.31	1.03	26.8	50.8	10100	0.331	-10200	23.1	117	4.81	0.749	0.002	-0.0789	-0.448	33.5	33.4
E038	9/3/18 12:47	WT_LAP-18-156598	700	0.516	22400	7.25	-5	3.04	0.929	25.8	49.6	7680	0.322	-11200	21.7	113	4.76	0.702	-0.31	-0.0978	-0.769	30.6	1.86
E038	9/3/18 12:49	WT_LAP-18-156599	900	0.52	23100	7.39	27	3.18	0.98	26.3	50.2	8880	0.327	-10700	22.4	115	4.78	0.725	-0.154	-0.0883	-0.608	32.1	17.6
E038	9/3/18 12:51	WT_LAP-18-156600	800	0.518	22800	7.32	11	3.11	0.954	26	49.9	8280	0.324	-11000	22.1	114	4.77	0.714	-0.232	-0.0931	-0.688	31.3	9.74
E038	9/3/18 12:53	WT_LAP-18-156601	700	0.516	22400	7.25	-5	3.04	0.929	25.8	49.6	7680	0.322	-11200	21.7	113	4.76	0.702	-0.31	-0.0978	-0.769	30.6	1.86
E038	9/3/18 12:55	WT_LAP-18-156602	500	0.511	21700	7.12	-37	2.91	0.878	25.3	48.9	6480	0.318	-11700	21	111	4.73	0.679	-0.466	-0.107	-0.929	29.1	-13.9
E038	9/3/18 12:57	WT_LAP-18-156603	400	0.508	21300	7.06	-53	2.84	0.853	25	48.6	5880	0.316	-12000	20.7	110	4.71	0.667	-0.544	-0.112	-1.01	28.4	-21.8
E038	9/3/18 12:58	WT_LAP-18-155894	400	0.508	21300	7.06	-53	2.84	0.853	25	48.6	5880	0.316	-12000	20.7	110	4.71	0.667	-0.544	-0.112	-1.01	28.4	-21.8
E038	9/3/18 12:59	WT_LAP-18-156604	300	0.506	21000	6.99	-69	2.77	0.827	24.8	48.3	5290	0.314	-12200	20.3	110	4.7	0.656	-0.622	-0.117	-1.09	27.6	-29.7
E038	9/3/18 13:19	WT_LAP-18-156605	200	0.504	20600	6.92	-85	2.7	0.802	24.5	47.9	4690	0.311	-12500	20	109	4.69	0.644	-0.7	-0.122	-1.17	26.9	-37.5
E038	9/3/18 13:39	WT_LAP-18-156606	100	0.501	20300	6.86	-101	2.64	0.776	24.3	47.6	4090	0.309	-12700	19.6	108	4.67	0.633	-0.778	-0.126	-1.25	26.1	-45.4
E039.1	8/2/18 19:38	WT_LAP-18-156109	500	0.511	21700	7.12	-37	2.91	0.878	25.3	48.9	6480	0.318	-11700	21	111	4.73	0.679	-0.466	-0.107	-0.929	29.1	-13.9
E039.1	8/2/18 19:40	WT_LAP-18-156110	500	0.511	21700	7.12	-37	2.91	0.878	25.3	48.9	6480	0.318	-11700	21	111	4.73	0.679	-0.466	-0.107	-0.929	29.1	-13.9

Table 4.3-1 (continued)

Station	Sample Collection Date and Time	Field Sample ID	Measured SSC (mg/L)	Estimated Total Recoverable Metals Concentrations and Unfiltered Isotopic Uranium Activities																			
				Ag (µg/L) 0.499 + 0.0000237a * SSCb	Al (µg/L) 19.895 + 3.59 * SSC	As (µg/L) 6.79 + 0.000663 * SSC	Ba (µg/L) –117 + 0.16 * SSC	Be (µg/L) 2.57 + 0.000673 * SSC	Cd (µg/L) 0.751 + 0.000254 * SSC	Cr (µg/L) 24 + 0.00255 * SSC	Cu (µg/L) 47.3 + 0.00322 * SSC	Fe (µg/L) 3489 + 5.99 * SSC	Hg (µg/L) 0.307 + 0.0000218 * SSC	Mn (µg/L) –12,962 + 2.51 * SSC	Ni (µg/L) 19.3 + 0.00344 * SSC	Pb (µg/L) 107 + 0.00864 * SSC	Se (µg/L) 4.66 + 0.000136 * SSC	Tl (µg/L) 0.621 + 0.000116 * SSC	U-234 (pCi/L) –0.856 + 0.00078c * SSC	U-235/236 (pCi/L) –0.131 + 0.0000474 * SSC	U-238 (pCi/L) –1.33 + 0.000802 * SSC	V (µg/L) 25.4 + 0.00739 * SSC	Zn (µg/L) –53.3 + 0.0788 * SSC
Sediment Background Value (mg/kg)				1	15400	3.98	127	1.31	0.4	10.5	11.2	13800	0.1	543	9.38	19.7	0.3	0.73	2.59	0.2	2.29	19.7	60.2
E039.1	8/2/18 19:42	WT_LAP-18-156111	400	0.508	21300	7.06	-53	2.84	0.853	25	48.6	5880	0.316	-12000	20.7	110	4.71	0.667	-0.544	-0.112	-1.01	28.4	-21.8
E039.1	8/2/18 19:44	WT_LAP-18-156112	400	0.508	21300	7.06	-53	2.84	0.853	25	48.6	5880	0.316	-12000	20.7	110	4.71	0.667	-0.544	-0.112	-1.01	28.4	-21.8
E039.1	8/2/18 19:46	WT_LAP-18-156113	300	0.506	21000	6.99	-69	2.77	0.827	24.8	48.3	5290	0.314	-12200	20.3	110	4.7	0.656	-0.622	-0.117	-1.09	27.6	-29.7
E039.1	8/2/18 19:48	WT_LAP-18-156114	300	0.506	21000	6.99	-69	2.77	0.827	24.8	48.3	5290	0.314	-12200	20.3	110	4.7	0.656	-0.622	-0.117	-1.09	27.6	-29.7
E039.1	8/2/18 19:49	WT_LAP-18-155610	300	0.506	21000	6.99	-69	2.77	0.827	24.8	48.3	5290	0.314	-12200	20.3	110	4.7	0.656	-0.622	-0.117	-1.09	27.6	-29.7
E039.1	8/2/18 19:50	WT_LAP-18-156115	300	0.506	21000	6.99	-69	2.77	0.827	24.8	48.3	5290	0.314	-12200	20.3	110	4.7	0.656	-0.622	-0.117	-1.09	27.6	-29.7
E039.1	8/2/18 19:52	WT_LAP-18-156116	300	0.506	21000	6.99	-69	2.77	0.827	24.8	48.3	5290	0.314	-12200	20.3	110	4.7	0.656	-0.622	-0.117	-1.09	27.6	-29.7
E039.1	8/2/18 19:54	WT_LAP-18-156117	200	0.504	20600	6.92	-85	2.7	0.802	24.5	47.9	4690	0.311	-12500	20	109	4.69	0.644	-0.7	-0.122	-1.17	26.9	-37.5
E039.1	8/2/18 19:56	WT_LAP-18-156118	200	0.504	20600	6.92	-85	2.7	0.802	24.5	47.9	4690	0.311	-12500	20	109	4.69	0.644	-0.7	-0.122	-1.17	26.9	-37.5
E039.1	8/2/18 19:58	WT_LAP-18-156119	200	0.504	20600	6.92	-85	2.7	0.802	24.5	47.9	4690	0.311	-12500	20	109	4.69	0.644	-0.7	-0.122	-1.17	26.9	-37.5
E039.1	8/2/18 20:00	WT_LAP-18-156120	200	0.504	20600	6.92	-85	2.7	0.802	24.5	47.9	4690	0.311	-12500	20	109	4.69	0.644	-0.7	-0.122	-1.17	26.9	-37.5
E039.1	8/2/18 20:02	WT_LAP-18-156121	200	0.504	20600	6.92	-85	2.7	0.802	24.5	47.9	4690	0.311	-12500	20	109	4.69	0.644	-0.7	-0.122	-1.17	26.9	-37.5
E039.1	8/2/18 20:04	WT_LAP-18-156122	200	0.504	20600	6.92	-85	2.7	0.802	24.5	47.9	4690	0.311	-12500	20	109	4.69	0.644	-0.7	-0.122	-1.17	26.9	-37.5
E039.1	8/2/18 20:06	WT_LAP-18-156123	200	0.504	20600	6.92	-85	2.7	0.802	24.5	47.9	4690	0.311	-12500	20	109	4.69	0.644	-0.7	-0.122	-1.17	26.9	-37.5
E039.1	8/2/18 20:07	WT_LAP-18-155850	200	0.504	20600	6.92	-85	2.7	0.802	24.5	47.9	4690	0.311	-12500	20	109	4.69	0.644	-0.7	-0.122	-1.17	26.9	-37.5
E039.1	8/2/18 20:08	WT_LAP-18-156124	200	0.504	20600	6.92	-85	2.7	0.802	24.5	47.9	4690	0.311	-12500	20	109	4.69	0.644	-0.7	-0.122	-1.17	26.9	-37.5
E039.1	8/2/18 20:28	WT_LAP-18-156125	100	0.501	20300	6.86	-101	2.64	0.776	24.3	47.6	4090	0.309	-12700	19.6	108	4.67	0.633	-0.778	-0.126	-1.25	26.1	-45.4
E039.1	8/2/18 20:48	WT_LAP-18-156126	100	0.501	20300	6.86	-101	2.64	0.776	24.3	47.6	4090	0.309	-12700	19.6	108	4.67	0.633	-0.778	-0.126	-1.25	26.1	-45.4
E039.1	8/10/18 16:39	WT_LAP-18-156277	1800	0.542	26400	7.98	171	3.78	1.21	28.6	53.1	14300	0.346	-8440	25.5	123	4.9	0.83	0.548	-0.0457	0.114	38.7	88.5
E039.1	8/10/18 16:41	WT_LAP-18-156278	1500	0.535	25300	7.78	123	3.58	1.13	27.8	52.1	12500	0.34	-9200	24.5	120	4.86	0.795	0.314	-0.0599	-0.127	36.5	64.9
E039.1	8/10/18 16:43	WT_LAP-18-156279	1400	0.532	24900	7.72	107	3.51	1.11	27.6	51.8	11900	0.338	-9450	24.1	119	4.85	0.783	0.236	-0.0646	-0.207	35.7	57
E039.1	8/10/18 16:45	WT_LAP-18-156280	1200	0.527	24200	7.59	75	3.38	1.06	27.1	51.2	10700	0.333	-9950	23.4	117	4.82	0.76	0.08	-0.0741	-0.368	34.3	41.3
E039.1	8/10/18 16:47	WT_LAP-18-156281	1100	0.525	23800	7.52	59	3.31	1.03	26.8	50.8	10100	0.331	-10200	23.1	117	4.81	0.749	0.002	-0.0789	-0.448	33.5	33.4
E039.1	8/10/18 16:49	WT_LAP-18-156282	1000	0.523	23500	7.45	43	3.24	1	26.6	50.5	9480	0.329	-10500	22.7	116	4.8	0.737	-0.076	-0.0836	-0.528	32.8	25.5
E039.1	8/10/18 16:50	WT_LAP-18-155625	900	0.52	23100	7.39	27	3.18	0.98	26.3	50.2	8880	0.327	-10700	22.4	115	4.78	0.725	-0.154	-0.0883	-0.608	32.1	17.6
E039.1	8/10/18 16:51	WT_LAP-18-156283	900	0.52	23100	7.39	27	3.18	0.98	26.3	50.2	8880	0.327	-10700	22.4	115	4.78	0.725	-0.154	-0.0883	-0.608	32.1	17.6
E039.1	8/10/18 16:53	WT_LAP-18-156284	800	0.518	22800	7.32	11	3.11	0.954	26	49.9	8280	0.324	-11000	22.1	114	4.77	0.714	-0.232	-0.0931	-0.688	31.3	9.74
E039.1	8/10/18 16:55	WT_LAP-18-156285	700	0.516	22400	7.25	-5	3.04	0.929	25.8	49.6	7680	0.322	-11200	21.7	113	4.76	0.702	-0.31	-0.0978	-0.769	30.6	1.86

Table 4.3-1 (continued)

Station	Sample Collection Date and Time	Field Sample ID	Measured SSC (mg/L)	Estimated Total Recoverable Metals Concentrations and Unfiltered Isotopic Uranium Activities																			
				Ag (µg/L) 0.499 + 0.0000237[a] * SSC[b]	Al (µg/L) 19,895 + 3.59 * SSC	As (µg/L) 6.79 + 0.000663 * SSC	Ba (µg/L) –117 + 0.16 * SSC	Be (µg/L) 2.57 + 0.000673 * SSC	Cd (µg/L) 0.751 + 0.000254 * SSC	Cr (µg/L) 24 + 0.00255 * SSC	Cu (µg/L) 47.3 + 0.00322 * SSC	Fe (µg/L) 3489 + 5.99 * SSC	Hg (µg/L) 0.307 + 0.0000218 * SSC	Mn (µg/L) –12,962 + 2.51 * SSC	Ni (µg/L) 19.3 + 0.00344 * SSC	Pb (µg/L) 107 + 0.00864 * SSC	Se (µg/L) 4.66 + 0.000136 * SSC	Tl (µg/L) 0.621 + 0.000116 * SSC	U-234 (pCi/L) –0.856 + 0.00078[c] * SSC	U-235/236 (pCi/L) –0.131 + 0.0000474 * SSC	U-238 (pCi/L) –1.33 + 0.000802 * SSC	V (µg/L) 25.4 + 0.00739 * SSC	Zn (µg/L) –53.3 + 0.0788 * SSC
Sediment Background Value (mg/kg)				1	15400	3.98	127	1.31	0.4	10.5	11.2	13800	0.1	543	9.38	19.7	0.3	0.73	2.59	0.2	2.29	19.7	60.2
E039.1	8/10/18 16:57	WT_LAP-18-156286	600	0.513	22000	7.19	-21	2.97	0.903	25.5	49.2	7080	0.32	-11500	21.4	112	4.74	0.691	-0.388	-0.103	-0.849	29.8	-6.02
E039.1	8/10/18 16:59	WT_LAP-18-156287	600	0.513	22000	7.19	-21	2.97	0.903	25.5	49.2	7080	0.32	-11500	21.4	112	4.74	0.691	-0.388	-0.103	-0.849	29.8	-6.02
E039.1	8/10/18 17:01	WT_LAP-18-156288	600	0.513	22000	7.19	-21	2.97	0.903	25.5	49.2	7080	0.32	-11500	21.4	112	4.74	0.691	-0.388	-0.103	-0.849	29.8	-6.02
E039.1	8/10/18 17:03	WT_LAP-18-156289	500	0.511	21700	7.12	-37	2.91	0.878	25.3	48.9	6480	0.318	-11700	21	111	4.73	0.679	-0.466	-0.107	-0.929	29.1	-13.9
E039.1	8/10/18 17:05	WT_LAP-18-156290	500	0.511	21700	7.12	-37	2.91	0.878	25.3	48.9	6480	0.318	-11700	21	111	4.73	0.679	-0.466	-0.107	-0.929	29.1	-13.9
E039.1	8/10/18 17:07	WT_LAP-18-156291	400	0.508	21300	7.06	-53	2.84	0.853	25	48.6	5880	0.316	-12000	20.7	110	4.71	0.667	-0.544	-0.112	-1.01	28.4	-21.8
E039.1	8/10/18 17:08	WT_LAP-18-155865	500	0.511	21700	7.12	-37	2.91	0.878	25.3	48.9	6480	0.318	-11700	21	111	4.73	0.679	-0.466	-0.107	-0.929	29.1	-13.9
E039.1	8/10/18 17:09	WT_LAP-18-156292	400	0.508	21300	7.06	-53	2.84	0.853	25	48.6	5880	0.316	-12000	20.7	110	4.71	0.667	-0.544	-0.112	-1.01	28.4	-21.8
E039.1	8/10/18 17:29	WT_LAP-18-156293	300	0.506	21000	6.99	-69	2.77	0.827	24.8	48.3	5290	0.314	-12200	20.3	110	4.7	0.656	-0.622	-0.117	-1.09	27.6	-29.7
E039.1	8/15/18 13:49	WT_LAP-18-156445	400	0.508	21300	7.06	-53	2.84	0.853	25	48.6	5880	0.316	-12000	20.7	110	4.71	0.667	-0.544	-0.112	-1.01	28.4	-21.8
E039.1	8/15/18 13:51	WT_LAP-18-156446	400	0.508	21300	7.06	-53	2.84	0.853	25	48.6	5880	0.316	-12000	20.7	110	4.71	0.667	-0.544	-0.112	-1.01	28.4	-21.8
E039.1	8/15/18 13:53	WT_LAP-18-156447	300	0.506	21000	6.99	-69	2.77	0.827	24.8	48.3	5290	0.314	-12200	20.3	110	4.7	0.656	-0.622	-0.117	-1.09	27.6	-29.7
E039.1	8/15/18 13:54	WT_LAP-18-155640	300	0.506	21000	6.99	-69	2.77	0.827	24.8	48.3	5290	0.314	-12200	20.3	110	4.7	0.656	-0.622	-0.117	-1.09	27.6	-29.7
E039.1	8/15/18 13:55	WT_LAP-18-156448	300	0.506	21000	6.99	-69	2.77	0.827	24.8	48.3	5290	0.314	-12200	20.3	110	4.7	0.656	-0.622	-0.117	-1.09	27.6	-29.7
E039.1	8/15/18 13:57	WT_LAP-18-156449	300	0.506	21000	6.99	-69	2.77	0.827	24.8	48.3	5290	0.314	-12200	20.3	110	4.7	0.656	-0.622	-0.117	-1.09	27.6	-29.7
E039.1	8/15/18 13:59	WT_LAP-18-156450	300	0.506	21000	6.99	-69	2.77	0.827	24.8	48.3	5290	0.314	-12200	20.3	110	4.7	0.656	-0.622	-0.117	-1.09	27.6	-29.7
E039.1	8/15/18 14:01	WT_LAP-18-156451	300	0.506	21000	6.99	-69	2.77	0.827	24.8	48.3	5290	0.314	-12200	20.3	110	4.7	0.656	-0.622	-0.117	-1.09	27.6	-29.7
E039.1	8/15/18 14:03	WT_LAP-18-156452	300	0.506	21000	6.99	-69	2.77	0.827	24.8	48.3	5290	0.314	-12200	20.3	110	4.7	0.656	-0.622	-0.117	-1.09	27.6	-29.7
E039.1	8/15/18 14:05	WT_LAP-18-156453	300	0.506	21000	6.99	-69	2.77	0.827	24.8	48.3	5290	0.314	-12200	20.3	110	4.7	0.656	-0.622	-0.117	-1.09	27.6	-29.7
E039.1	8/15/18 14:07	WT_LAP-18-156454	300	0.506	21000	6.99	-69	2.77	0.827	24.8	48.3	5290	0.314	-12200	20.3	110	4.7	0.656	-0.622	-0.117	-1.09	27.6	-29.7
E039.1	8/15/18 14:09	WT_LAP-18-156455	200	0.504	20600	6.92	-85	2.7	0.802	24.5	47.9	4690	0.311	-12500	20	109	4.69	0.644	-0.7	-0.122	-1.17	26.9	-37.5
E039.1	8/15/18 14:11	WT_LAP-18-156456	200	0.504	20600	6.92	-85	2.7	0.802	24.5	47.9	4690	0.311	-12500	20	109	4.69	0.644	-0.7	-0.122	-1.17	26.9	-37.5
E039.1	8/15/18 14:12	WT_LAP-18-155880	200	0.504	20600	6.92	-85	2.7	0.802	24.5	47.9	4690	0.311	-12500	20	109	4.69	0.644	-0.7	-0.122	-1.17	26.9	-37.5
E039.1	8/15/18 14:13	WT_LAP-18-156457	200	0.504	20600	6.92	-85	2.7	0.802	24.5	47.9	4690	0.311	-12500	20	109	4.69	0.644	-0.7	-0.122	-1.17	26.9	-37.5
E039.1	8/15/18 14:15	WT_LAP-18-156458	200	0.504	20600	6.92	-85	2.7	0.802	24.5	47.9	4690	0.311	-12500	20	109	4.69	0.644	-0.7	-0.122	-1.17	26.9	-37.5
E039.1	8/15/18 14:17	WT_LAP-18-156459	200	0.504	20600	6.92	-85	2.7	0.802	24.5	47.9	4690	0.311	-12500	20	109	4.69	0.644	-0.7	-0.122	-1.17	26.9	-37.5
E039.1	8/15/18 14:19	WT_LAP-18-156460	200	0.504	20600	6.92	-85	2.7	0.802	24.5	47.9	4690	0.311	-12500	20	109	4.69	0.644	-0.7	-0.122	-1.17	26.9	-37.5
E039.1	8/15/18 14:39	WT_LAP-18-156461	200	0.504	20600	6.92	-85	2.7	0.802	24.5	47.9	4690	0.311	-12500	20	109	4.69	0.644	-0.7	-0.122	-1.17	26.9	-37.5

Table 4.3-1 (continued)

Station	Sample Collection Date and Time	Field Sample ID	Measured SSC (mg/L)	Estimated Total Recoverable Metals Concentrations and Unfiltered Isotopic Uranium Activities																			
				Ag (µg/L) 0.499 + 0.0000237a * SSCb	Al (µg/L) 19,895 + 3.59 * SSC	As (µg/L) 6.79 + 0.000663 * SSC	Ba (µg/L) −117 + 0.16 * SSC	Be (µg/L) 2.57 + 0.000673 * SSC	Cd (µg/L) 0.751 + 0.000254 * SSC	Cr (µg/L) 24 + 0.00255 * SSC	Cu (µg/L) 47.3 + 0.00322 * SSC	Fe (µg/L) 3489 + 5.99 * SSC	Hg (µg/L) 0.307 + 0.0000218 * SSC	Mn (µg/L) −12,962 + 2.51 * SSC	Ni (µg/L) 19.3 + 0.00344 * SSC	Pb (µg/L) 107 + 0.00864 * SSC	Se (µg/L) 4.66 + 0.000136 * SSC	Tl (µg/L) 0.621 + 0.000116 * SSC	U-234 (pCi/L) −0.856 + 0.00078c * SSC	U-235/236 (pCi/L) −0.131 + 0.0000474 * SSC	U-238 (pCi/L) −1.33 + 0.000802 * SSC	V (µg/L) 25.4 + 0.00739 * SSC	Zn (µg/L) −53.3 + 0.0788 * SSC
Sediment Background Value (mg/kg)				1	15400	3.98	127	1.31	0.4	10.5	11.2	13800	0.1	543	9.38	19.7	0.3	0.73	2.59	0.2	2.29	19.7	60.2
E039.1	9/3/18 13:17	WT_LAP-18-156613	300	0.506	21000	6.99	-69	2.77	0.827	24.8	48.3	5290	0.314	-12200	20.3	110	4.7	0.656	-0.622	-0.117	-1.09	27.6	-29.7
E039.1	9/3/18 13:19	WT_LAP-18-156614	300	0.506	21000	6.99	-69	2.77	0.827	24.8	48.3	5290	0.314	-12200	20.3	110	4.7	0.656	-0.622	-0.117	-1.09	27.6	-29.7
E039.1	9/3/18 13:21	WT_LAP-18-156615	200	0.504	20600	6.92	-85	2.7	0.802	24.5	47.9	4690	0.311	-12500	20	109	4.69	0.644	-0.7	-0.122	-1.17	26.9	-37.5
E039.1	9/3/18 13:22	WT_LAP-18-155655	300	0.506	21000	6.99	-69	2.77	0.827	24.8	48.3	5290	0.314	-12200	20.3	110	4.7	0.656	-0.622	-0.117	-1.09	27.6	-29.7
E039.1	9/3/18 13:23	WT_LAP-18-156616	200	0.504	20600	6.92	-85	2.7	0.802	24.5	47.9	4690	0.311	-12500	20	109	4.69	0.644	-0.7	-0.122	-1.17	26.9	-37.5
E039.1	9/3/18 13:25	WT_LAP-18-156617	200	0.504	20600	6.92	-85	2.7	0.802	24.5	47.9	4690	0.311	-12500	20	109	4.69	0.644	-0.7	-0.122	-1.17	26.9	-37.5
E039.1	9/3/18 13:27	WT_LAP-18-156618	200	0.504	20600	6.92	-85	2.7	0.802	24.5	47.9	4690	0.311	-12500	20	109	4.69	0.644	-0.7	-0.122	-1.17	26.9	-37.5
E039.1	9/3/18 13:29	WT_LAP-18-156619	200	0.504	20600	6.92	-85	2.7	0.802	24.5	47.9	4690	0.311	-12500	20	109	4.69	0.644	-0.7	-0.122	-1.17	26.9	-37.5
E039.1	9/3/18 13:31	WT_LAP-18-156620	200	0.504	20600	6.92	-85	2.7	0.802	24.5	47.9	4690	0.311	-12500	20	109	4.69	0.644	-0.7	-0.122	-1.17	26.9	-37.5
E039.1	9/3/18 13:33	WT_LAP-18-156621	100	0.501	20300	6.86	-101	2.64	0.776	24.3	47.6	4090	0.309	-12700	19.6	108	4.67	0.633	-0.778	-0.126	-1.25	26.1	-45.4
E039.1	9/3/18 13:35	WT_LAP-18-156622	100	0.501	20300	6.86	-101	2.64	0.776	24.3	47.6	4090	0.309	-12700	19.6	108	4.67	0.633	-0.778	-0.126	-1.25	26.1	-45.4
E039.1	9/3/18 13:37	WT_LAP-18-156623	200	0.504	20600	6.92	-85	2.7	0.802	24.5	47.9	4690	0.311	-12500	20	109	4.69	0.644	-0.7	-0.122	-1.17	26.9	-37.5
E039.1	9/3/18 13:39	WT_LAP-18-156624	100	0.501	20300	6.86	-101	2.64	0.776	24.3	47.6	4090	0.309	-12700	19.6	108	4.67	0.633	-0.778	-0.126	-1.25	26.1	-45.4
E039.1	9/3/18 13:40	WT_LAP-18-155895	200	0.504	20600	6.92	-85	2.7	0.802	24.5	47.9	4690	0.311	-12500	20	109	4.69	0.644	-0.7	-0.122	-1.17	26.9	-37.5
E039.1	9/3/18 13:41	WT_LAP-18-156625	100	0.501	20300	6.86	-101	2.64	0.776	24.3	47.6	4090	0.309	-12700	19.6	108	4.67	0.633	-0.778	-0.126	-1.25	26.1	-45.4
E039.1	9/3/18 13:43	WT_LAP-18-156626	100	0.501	20300	6.86	-101	2.64	0.776	24.3	47.6	4090	0.309	-12700	19.6	108	4.67	0.633	-0.778	-0.126	-1.25	26.1	-45.4
E039.1	9/3/18 13:45	WT_LAP-18-156627	100	0.501	20300	6.86	-101	2.64	0.776	24.3	47.6	4090	0.309	-12700	19.6	108	4.67	0.633	-0.778	-0.126	-1.25	26.1	-45.4
E039.1	9/3/18 13:47	WT_LAP-18-156628	100	0.501	20300	6.86	-101	2.64	0.776	24.3	47.6	4090	0.309	-12700	19.6	108	4.67	0.633	-0.778	-0.126	-1.25	26.1	-45.4
E039.1	9/4/18 13:22	WT_LAP-18-161783	1100	0.525	23800	7.52	59	3.31	1.03	26.8	50.8	10100	0.331	-10200	23.1	117	4.81	0.749	0.002	-0.0789	-0.448	33.5	33.4
E039.1	9/4/18 13:24	WT_LAP-18-161784	1000	0.523	23500	7.45	43	3.24	1	26.6	50.5	9480	0.329	-10500	22.7	116	4.8	0.737	-0.076	-0.0836	-0.528	32.8	25.5
E039.1	9/4/18 13:26	WT_LAP-18-161785	900	0.52	23100	7.39	27	3.18	0.98	26.3	50.2	8880	0.327	-10700	22.4	115	4.78	0.725	-0.154	-0.0883	-0.608	32.1	17.6
E039.1	9/4/18 13:28	WT_LAP-18-161786	800	0.518	22800	7.32	11	3.11	0.954	26	49.9	8280	0.324	-11000	22.1	114	4.77	0.714	-0.232	-0.0931	-0.688	31.3	9.74
E039.1	9/4/18 13:30	WT_LAP-18-161787	700	0.516	22400	7.25	-5	3.04	0.929	25.8	49.6	7680	0.322	-11200	21.7	113	4.76	0.702	-0.31	-0.0978	-0.769	30.6	1.86
E039.1	9/4/18 13:32	WT_LAP-18-161664	700	0.516	22400	7.25	-5	3.04	0.929	25.8	49.6	7680	0.322	-11200	21.7	113	4.76	0.702	-0.31	-0.0978	-0.769	30.6	1.86
E039.1	9/4/18 13:32	WT_LAP-18-161788	700	0.516	22400	7.25	-5	3.04	0.929	25.8	49.6	7680	0.322	-11200	21.7	113	4.76	0.702	-0.31	-0.0978	-0.769	30.6	1.86
E039.1	9/4/18 13:34	WT_LAP-18-161789	600	0.513	22000	7.19	-21	2.97	0.903	25.5	49.2	7080	0.32	-11500	21.4	112	4.74	0.691	-0.388	-0.103	-0.849	29.8	-6.02
E039.1	9/4/18 13:36	WT_LAP-18-161790	600	0.513	22000	7.19	-21	2.97	0.903	25.5	49.2	7080	0.32	-11500	21.4	112	4.74	0.691	-0.388	-0.103	-0.849	29.8	-6.02
E039.1	9/4/18 13:38	WT_LAP-18-161791	600	0.513	22000	7.19	-21	2.97	0.903	25.5	49.2	7080	0.32	-11500	21.4	112	4.74	0.691	-0.388	-0.103	-0.849	29.8	-6.02

Table 4.3-1 (continued)

Station	Sample Collection Date and Time	Field Sample ID	Measured SSC (mg/L)	Estimated Total Recoverable Metals Concentrations and Unfiltered Isotopic Uranium Activities																			
				Ag (µg/L) 0.499 + 0.0000237a * SSCb	Al (µg/L) 19,895 + 3.59 * SSC	As (µg/L) 6.79 + 0.000663 * SSC	Ba (µg/L) −117 + 0.16 * SSC	Be (µg/L) 2.57 + 0.000673 * SSC	Cd (µg/L) 0.751 + 0.000254 * SSC	Cr (µg/L) 24 + 0.00255 * SSC	Cu (µg/L) 47.3 + 0.00322 * SSC	Fe (µg/L) 3489 + 5.99 * SSC	Hg (µg/L) 0.307 + 0.0000218 * SSC	Mn (µg/L) −12,962 + 2.51 * SSC	Ni (µg/L) 19.3 + 0.00344 * SSC	Pb (µg/L) 107 + 0.00864 * SSC	Se (µg/L) 4.66 + 0.000136 * SSC	Tl (µg/L) 0.621 + 0.000116 * SSC	U-234 (pCi/L) −0.856 + 0.00078c * SSC	U-235/236 (pCi/L) −0.131 + 0.0000474 * SSC	U-238 (pCi/L) −1.33 + 0.000802 * SSC	V (µg/L) 25.4 + 0.00739 * SSC	Zn (µg/L) −53.3 + 0.0788 * SSC
Sediment Background Value (mg/kg)				1	15400	3.98	127	1.31	0.4	10.5	11.2	13800	0.1	543	9.38	19.7	0.3	0.73	2.59	0.2	2.29	19.7	60.2
E039.1	9/4/18 13:40	WT_LAP-18-161792	500	0.511	21700	7.12	-37	2.91	0.878	25.3	48.9	6480	0.318	-11700	21	111	4.73	0.679	-0.466	-0.107	-0.929	29.1	-13.9
E039.1	9/4/18 13:42	WT_LAP-18-161793	500	0.511	21700	7.12	-37	2.91	0.878	25.3	48.9	6480	0.318	-11700	21	111	4.73	0.679	-0.466	-0.107	-0.929	29.1	-13.9
E039.1	9/4/18 13:44	WT_LAP-18-161794	500	0.511	21700	7.12	-37	2.91	0.878	25.3	48.9	6480	0.318	-11700	21	111	4.73	0.679	-0.466	-0.107	-0.929	29.1	-13.9
E039.1	9/4/18 13:46	WT_LAP-18-161795	500	0.511	21700	7.12	-37	2.91	0.878	25.3	48.9	6480	0.318	-11700	21	111	4.73	0.679	-0.466	-0.107	-0.929	29.1	-13.9
E039.1	9/4/18 13:48	WT_LAP-18-161796	400	0.508	21300	7.06	-53	2.84	0.853	25	48.6	5880	0.316	-12000	20.7	110	4.71	0.667	-0.544	-0.112	-1.01	28.4	-21.8
E039.1	9/4/18 13:50	WT_LAP-18-161728	400	0.508	21300	7.06	-53	2.84	0.853	25	48.6	5880	0.316	-12000	20.7	110	4.71	0.667	-0.544	-0.112	-1.01	28.4	-21.8
E039.1	9/4/18 13:50	WT_LAP-18-161797	400	0.508	21300	7.06	-53	2.84	0.853	25	48.6	5880	0.316	-12000	20.7	110	4.71	0.667	-0.544	-0.112	-1.01	28.4	-21.8
E039.1	9/4/18 13:52	WT_LAP-18-161798	400	0.508	21300	7.06	-53	2.84	0.853	25	48.6	5880	0.316	-12000	20.7	110	4.71	0.667	-0.544	-0.112	-1.01	28.4	-21.8
E039.1	9/4/18 14:12	WT_LAP-18-161799	200	0.504	20600	6.92	-85	2.7	0.802	24.5	47.9	4690	0.311	-12500	20	109	4.69	0.644	-0.7	-0.122	-1.17	26.9	-37.5
E039.1	9/4/18 14:32	WT_LAP-18-161800	200	0.504	20600	6.92	-85	2.7	0.802	24.5	47.9	4690	0.311	-12500	20	109	4.69	0.644	-0.7	-0.122	-1.17	26.9	-37.5
E039.1	9/4/18 14:52	WT_LAP-18-161801	200	0.504	20600	6.92	-85	2.7	0.802	24.5	47.9	4690	0.311	-12500	20	109	4.69	0.644	-0.7	-0.122	-1.17	26.9	-37.5
E040	8/10/18 17:28	WT_LAP-18-155608	2600	0.561	29200	8.51	299	4.32	1.41	30.6	55.7	19100	0.364	-6440	28.2	129	5.01	0.923	1.17	-0.00776	0.755	44.6	152
E040	8/10/18 17:46	WT_LAP-18-155848	1500	0.535	25300	7.78	123	3.58	1.13	27.8	52.1	12500	0.34	-9200	24.5	120	4.86	0.795	0.314	-0.0599	-0.127	36.5	64.9
E040	9/4/18 14:03	WT_LAP-18-155623	2600	0.561	29200	8.51	299	4.32	1.41	30.6	55.7	19100	0.364	-6440	28.2	129	5.01	0.923	1.17	-0.00776	0.755	44.6	152
E040	9/4/18 14:21	WT_LAP-18-155863	2600	0.561	29200	8.51	299	4.32	1.41	30.6	55.7	19100	0.364	-6440	28.2	129	5.01	0.923	1.17	-0.00776	0.755	44.6	152
E040	9/5/18 20:28	WT_LAP-18-155638	600	0.513	22000	7.19	-21	2.97	0.903	25.5	49.2	7080	0.32	-11500	21.4	112	4.74	0.691	-0.388	-0.103	-0.849	29.8	-6.02
E040	9/5/18 20:46	WT_LAP-18-155878	400	0.508	21300	7.06	-53	2.84	0.853	25	48.6	5880	0.316	-12000	20.7	110	4.71	0.667	-0.544	-0.112	-1.01	28.4	-21.8
E040	10/23/18 17:39	WT_LAP-18-155653	1000	0.523	23500	7.45	43	3.24	1	26.6	50.5	9480	0.329	-10500	22.7	116	4.8	0.737	-0.076	-0.0836	-0.528	32.8	25.5
E040	10/23/18 17:57	WT_LAP-18-155893	600	0.513	22000	7.19	-21	2.97	0.903	25.5	49.2	7080	0.32	-11500	21.4	112	4.74	0.691	-0.388	-0.103	-0.849	29.8	-6.02
E042.1	9/4/18 15:03	WT_LAP-18-156181	9300	0.719	53300	13	1370	8.83	3.11	47.7	77.2	59200	0.51	10400	51.3	187	5.92	1.7	6.4	0.31	6.13	94.1	680
E042.1	9/4/18 15:05	WT_LAP-18-156182	8300	0.696	49700	12.3	1210	8.16	2.86	45.2	74	53200	0.488	7870	47.9	179	5.79	1.58	5.62	0.262	5.33	86.7	601
E042.1	9/4/18 15:07	WT_LAP-18-156183	7300	0.672	46100	11.6	1050	7.48	2.61	42.6	70.8	47200	0.466	5360	44.4	170	5.65	1.47	4.84	0.215	4.52	79.3	522
E042.1	9/4/18 15:09	WT_LAP-18-156184	6800	0.66	44300	11.3	971	7.15	2.48	41.3	69.2	44200	0.455	4110	42.7	166	5.58	1.41	4.45	0.191	4.12	75.7	483
E042.1	9/4/18 15:11	WT_LAP-18-156185	6100	0.644	41800	10.8	859	6.68	2.3	39.6	66.9	40000	0.44	2350	40.3	160	5.49	1.33	3.9	0.158	3.56	70.5	427
E042.1	9/4/18 15:12	WT_LAP-18-155614	5800	0.636	40700	10.6	811	6.47	2.22	38.8	66	38200	0.433	1600	39.3	157	5.45	1.29	3.67	0.144	3.32	68.3	404
E042.1	9/4/18 15:13	WT_LAP-18-156186	6100	0.644	41800	10.8	859	6.68	2.3	39.6	66.9	40000	0.44	2350	40.3	160	5.49	1.33	3.9	0.158	3.56	70.5	427
E042.1	9/4/18 15:15	WT_LAP-18-156187	5800	0.636	40700	10.6	811	6.47	2.22	38.8	66	38200	0.433	1600	39.3	157	5.45	1.29	3.67	0.144	3.32	68.3	404
E042.1	9/4/18 15:17	WT_LAP-18-156188	5600	0.632	40000	10.5	779	6.34	2.17	38.3	65.3	37000	0.429	1090	38.6	155	5.42	1.27	3.51	0.134	3.16	66.8	388

Table 4.3-1 (continued)

Station	Sample Collection Date and Time	Field Sample ID	Measured SSC (mg/L)	Ag (µg/L) 0.499 + 0.0000237a * SSCb	Al (µg/L) 19,895 + 3.59 * SSC	As (µg/L) 6.79 + 0.000663 * SSC	Ba (µg/L) –117 + 0.16 * SSC	Be (µg/L) 2.57 + 0.000673 * SSC	Cd (µg/L) 0.751 + 0.000254 * SSC	Cr (µg/L) 24 + 0.00255 * SSC	Cu (µg/L) 47.3 + 0.00322 * SSC	Fe (µg/L) 3489 + 5.99 * SSC	Hg (µg/L) 0.307 + 0.0000218 * SSC	Mn (µg/L) –12,962 + 2.51 * SSC	Ni (µg/L) 19.3 + 0.00344 * SSC	Pb (µg/L) 107 + 0.00864 * SSC	Se (µg/L) 4.66 + 0.000136 * SSC	Tl (µg/L) 0.621 + 0.000116 * SSC	U-234 (pCi/L) –0.856 + 0.00078c * SSC	U-235/236 (pCi/L) –0.131 + 0.0000474 * SSC	U-238 (pCi/L) –1.33 + 0.000802 * SSC	V (µg/L) 25.4 + 0.00739 * SSC	Zn (µg/L) –53.3 + 0.0788 * SSC
				Estimated Total Recoverable Metals Concentrations and Unfiltered Isotopic Uranium Activities																			
Sediment Background Value (mg/kg)				1	15400	3.98	127	1.31	0.4	10.5	11.2	13800	0.1	543	9.38	19.7	0.3	0.73	2.59	0.2	2.29	19.7	60.2
E042.1	9/4/18 15:19	WT_LAP-18-156189	5100	0.62	38200	10.2	699	6	2.05	37	63.7	34000	0.418	-161	36.8	151	5.35	1.21	3.12	0.111	2.76	63.1	349
E042.1	9/4/18 15:23	WT_LAP-18-156190	4400	0.603	35700	9.71	587	5.53	1.87	35.2	61.5	29800	0.403	-1920	34.4	145	5.26	1.13	2.58	0.0776	2.2	57.9	293
E042.1	9/4/18 15:27	WT_LAP-18-156191	3800	0.589	33500	9.31	491	5.13	1.72	33.7	59.5	26300	0.39	-3420	32.4	140	5.18	1.06	2.11	0.0491	1.72	53.5	246
E042.1	9/4/18 15:29	WT_LAP-18-156192	3600	0.584	32800	9.18	459	4.99	1.67	33.2	58.9	25100	0.385	-3930	31.7	138	5.15	1.04	1.95	0.0396	1.56	52	230
E042.1	9/4/18 15:30	WT_LAP-18-155854	3500	0.582	32500	9.11	443	4.93	1.64	32.9	58.6	24500	0.383	-4180	31.3	137	5.14	1.03	1.87	0.0349	1.48	51.3	222
E042.1	9/4/18 15:31	WT_LAP-18-156193	3600	0.584	32800	9.18	459	4.99	1.67	33.2	58.9	25100	0.385	-3930	31.7	138	5.15	1.04	1.95	0.0396	1.56	52	230
E042.1	9/4/18 15:33	WT_LAP-18-156194	3400	0.58	32100	9.04	427	4.86	1.61	32.7	58.2	23900	0.381	-4430	31	136	5.12	1.02	1.8	0.0302	1.4	50.5	215
E042.1	9/4/18 15:53	WT_LAP-18-156195	2500	0.558	28900	8.45	283	4.25	1.39	30.4	55.4	18500	0.362	-6690	27.9	129	5	0.911	1.09	-0.0125	0.675	43.9	144
E042.1	9/4/18 16:13	WT_LAP-18-156196	1900	0.544	26700	8.05	187	3.85	1.23	28.8	53.4	14900	0.348	-8190	25.8	123	4.92	0.841	0.626	-0.0409	0.194	39.4	96.4
E042.1	9/4/18 16:33	WT_LAP-18-156197	1200	0.527	24200	7.59	75	3.38	1.06	27.1	51.2	10700	0.333	-9950	23.4	117	4.82	0.76	0.08	-0.0741	-0.368	34.3	41.3
E042.1	9/4/18 16:53	WT_LAP-18-156198	900	0.52	23100	7.39	27	3.18	0.98	26.3	50.2	8880	0.327	-10700	22.4	115	4.78	0.725	-0.154	-0.0883	-0.608	32.1	17.6
E042.1	9/4/18 17:13	WT_LAP-18-156199	700	0.516	22400	7.25	-5	3.04	0.929	25.8	49.6	7680	0.322	-11200	21.7	113	4.76	0.702	-0.31	-0.0978	-0.769	30.6	1.86
E042.1	9/4/18 17:33	WT_LAP-18-156200	500	0.511	21700	7.12	-37	2.91	0.878	25.3	48.9	6480	0.318	-11700	21	111	4.73	0.679	-0.466	-0.107	-0.929	29.1	-13.9
E055	8/9/18 18:00	WT_LAP-18-155617	1800	0.542	26400	7.98	171	3.78	1.21	28.6	53.1	14300	0.346	-8440	25.5	123	4.9	0.83	0.548	-0.0457	0.114	38.7	88.5
E055	8/9/18 18:18	WT_LAP-18-155857	1300	0.53	24600	7.65	91	3.44	1.08	27.3	51.5	11300	0.335	-9700	23.8	118	4.84	0.772	0.158	-0.0694	-0.287	35	49.1
E055	8/9/18 18:18	WT_LAP-18-155857	1400	0.532	24900	7.72	107	3.51	1.11	27.6	51.8	11900	0.338	-9450	24.1	119	4.85	0.783	0.236	-0.0646	-0.207	35.7	57
E055.5	8/2/18 18:54	WT_LAP-18-155619	2000	0.546	27100	8.12	203	3.92	1.26	29.1	53.7	15500	0.351	-7940	26.2	124	4.93	0.853	0.704	-0.0362	0.274	40.2	104
E055.5	8/2/18 19:16	WT_LAP-18-155859	400	0.508	21300	7.06	-53	2.84	0.853	25	48.6	5880	0.316	-12000	20.7	110	4.71	0.667	-0.544	-0.112	-1.01	28.4	-21.8
E055.5	8/2/18 19:16	WT_LAP-18-155859	700	0.516	22400	7.25	-5	3.04	0.929	25.8	49.6	7680	0.322	-11200	21.7	113	4.76	0.702	-0.31	-0.0978	-0.769	30.6	1.86
E055.5	9/3/18 12:28	WT_LAP-18-155634	2000	0.546	27100	8.12	203	3.92	1.26	29.1	53.7	15500	0.351	-7940	26.2	124	4.93	0.853	0.704	-0.0362	0.274	40.2	104
E055.5	9/3/18 12:49	WT_LAP-18-155874	200	0.504	20600	6.92	-85	2.7	0.802	24.5	47.9	4690	0.311	-12500	20	109	4.69	0.644	-0.7	-0.122	-1.17	26.9	-37.5
E056	7/13/18 13:49	WT_LAP-18-155620	7300	0.672	46100	11.6	1050	7.48	2.61	42.6	70.8	47200	0.466	5360	44.4	170	5.65	1.47	4.84	0.215	4.52	79.3	522
E056	7/13/18 14:07	WT_LAP-18-155860	1000	0.523	23500	7.45	43	3.24	1	26.6	50.5	9480	0.329	-10500	22.7	116	4.8	0.737	-0.076	-0.0836	-0.528	32.8	25.5
E056	7/13/18 14:07	WT_LAP-18-155860	1300	0.53	24600	7.65	91	3.44	1.08	27.3	51.5	11300	0.335	-9700	23.8	118	4.84	0.772	0.158	-0.0694	-0.287	35	49.1
E056	7/17/18 11:54	WT_LAP-18-155635	1100	0.525	23800	7.52	59	3.31	1.03	26.8	50.8	10100	0.331	-10200	23.1	117	4.81	0.749	0.002	-0.0789	-0.448	33.5	33.4
E056	7/17/18 12:12	WT_LAP-18-155875	600	0.513	22000	7.19	-21	2.97	0.903	25.5	49.2	7080	0.32	-11500	21.4	112	4.74	0.691	-0.388	-0.103	-0.849	29.8	-6.02
E056	7/17/18 12:12	WT_LAP-18-155875	700	0.516	22400	7.25	-5	3.04	0.929	25.8	49.6	7680	0.322	-11200	21.7	113	4.76	0.702	-0.31	-0.0978	-0.769	30.6	1.86
E056	7/17/18 12:12	WT_LAP-18-155875	800	0.518	22800	7.32	11	3.11	0.954	26	49.9	8280	0.324	-11000	22.1	114	4.77	0.714	-0.232	-0.0931	-0.688	31.3	9.74

Table 4.3-1 (continued)

Station	Sample Collection Date and Time	Field Sample ID	Measured SSC (mg/L)	Estimated Total Recoverable Metals Concentrations and Unfiltered Isotopic Uranium Activities																			
				Ag (µg/L) 0.499 + 0.0000237a * SSCb	Al (µg/L) 19,895 + 3.59 * SSC	As (µg/L) 6.79 + 0.000663 * SSC	Ba (µg/L) −117 + 0.16 * SSC	Be (µg/L) 2.57 + 0.000673 * SSC	Cd (µg/L) 0.751 + 0.000254 * SSC	Cr (µg/L) 24 + 0.00255 * SSC	Cu (µg/L) 47.3 + 0.00322 * SSC	Fe (µg/L) 3489 + 5.99 * SSC	Hg (µg/L) 0.307 + 0.0000218 * SSC	Mn (µg/L) −12,962 + 2.51 * SSC	Ni (µg/L) 19.3 + 0.00344 * SSC	Pb (µg/L) 107 + 0.00864 * SSC	Se (µg/L) 4.66 + 0.000136 * SSC	Tl (µg/L) 0.621 + 0.000116 * SSC	U-234 (pCi/L) −0.856 + 0.00078c * SSC	U-235/236 (pCi/L) −0.131 + 0.0000474 * SSC	U-238 (pCi/L) −1.33 + 0.000802 * SSC	V (µg/L) 25.4 + 0.00739 * SSC	Zn (µg/L) −53.3 + 0.0788 * SSC
Sediment Background Value (mg/kg)				1	15400	3.98	127	1.31	0.4	10.5	11.2	13800	0.1	543	9.38	19.7	0.3	0.73	2.59	0.2	2.29	19.7	60.2
E056	8/9/18 17:45	WT_LAP-18-155650	700	0.516	22400	7.25	-5	3.04	0.929	25.8	49.6	7680	0.322	-11200	21.7	113	4.76	0.702	-0.31	-0.0978	-0.769	30.6	1.86
E056	8/9/18 18:03	WT_LAP-18-155890	300	0.506	21000	6.99	-69	2.77	0.827	24.8	48.3	5290	0.314	-12200	20.3	110	4.7	0.656	-0.622	-0.117	-1.09	27.6	-29.7
E056	8/9/18 18:03	WT_LAP-18-155890	400	0.508	21300	7.06	-53	2.84	0.853	25	48.6	5880	0.316	-12000	20.7	110	4.71	0.667	-0.544	-0.112	-1.01	28.4	-21.8
E056	9/4/18 13:30	WT_LAP-18-160850	2300	0.554	28200	8.31	251	4.12	1.34	29.9	54.7	17300	0.357	-7190	27.2	127	4.97	0.888	0.938	-0.022	0.515	42.4	128
E056	9/4/18 13:48	WT_LAP-18-160851	5000	0.617	37800	10.1	683	5.94	2.02	36.8	63.4	33400	0.416	-412	36.5	150	5.34	1.2	3.04	0.106	2.68	62.4	341

Note: Cells are shaded gray when SSC-estimated metals and isotopic uranium concentrations (µg/L or pCi/L) exceed background concentrations expected in sediment.

[a] Unit of inorganic slope is µg/L/mg/L.

[b] Unit of SSC measurement is mg/L

[c] Unit of radioisotope slope is pCi/L/mg/L.

Appendix A

2018 Geomorphic Changes
at Sediment Transport Mitigation Sites
in the Los Alamos/Pueblo Watershed

CONTENTS

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Attachments

A-1.0 INTRODUCTION

This report evaluates geomorphic changes that occurred from October 2017 to November 2018 at sediment transport mitigation sites in the Los Alamos/Pueblo (LA/P) watershed within and near Los Alamos National Laboratory (LANL or the Laboratory). This appendix also contains a comparison of the global positioning system (GPS) surveys encompassing accumulated change since 2011 where data is available and applicable (LANL 2011, 200902; LANL 2012, 218411; LANL 2015, 600439; LANL 2016, 601433; LANL 2017, 602343). Figure A-1.0-1 shows site locations discussed in this appendix. Attachment A-1 presents repeat photographs at some of the sediment transport mitigation sites. The New Mexico Environment Department (NMED) has also specified that monitoring reports include information on the health and success of willow plantings as well as photographic documentation of willow communities (NMED 2011, 204349); these observations are included herein with photographs included in Attachment A-1. Data tables of thalweg and bank survey points and distances are included in Attachment A-2 (on CD included with this document).

A-2.0 HYDROLOGIC EVENTS DURING 2018 MONSOON SEASON

Discharge in 2018 was similar to the 2017 discharge at all gage stations, being near or well below the mean for the 10-yr period of record. There were 11 sample-triggering storm events in 2018, with the largest runoff-producing event occurring on September 4 (see section 2.1 in the main text for more details).

A-3.0 GROUND-BASED SURVEY METHODS OF THE LA/P WATERSHED

Ground-based surveying in monitoring reaches of the LA/P watershed mapped geomorphic features such as channel banks and primary thalweg. These features were surveyed using real-time kinematic differentially corrected GPS surveying equipment. Survey data was collected in November and December 2018 after the 2018 northern New Mexico monsoon season. Stability of stream-channel features in areas near engineered erosion-control mitigation features in Pueblo Canyon are points of interest.

A-3.1 Ground-Based Survey of Thalweg and Channel Bank

Post-monsoon channel banks were surveyed from November to December 2018. Channel bank locations for the various monitoring areas between 2017 and 2018 and since 2011, where data are available, are compared in section 4.0 of this appendix.

The 2018 longitudinal channel thalweg profile was surveyed continually from the Pueblo Canyon grade-control structure (GCS) up to the Pueblo Canyon drop structure, from below the wing ditch area upstream into the upper willow planting area, and continuously in the DP-2 reach of DP Canyon. For each thalweg survey point, the distance along the thalweg was calculated as the straight-line distance between the western-most location and that point. This distance is referred to as the “canyon distance.” All ground-based survey data points are listed in Attachment A-2. This report presents the 2018 thalweg map view and gradient profile in comparison with data from 2011 through 2018 for all sections of Pueblo and DP Canyons where data were available.

A-4.0 GEOMORPHIC SURVEY RESULTS

The 2018 monsoon season was generally average to below average in rainfall intensity and resulted in minor annual changes to morphology of monitored features but caused no significant geomorphic changes within the LA/P watershed. Repeat GPS survey data since 2011 suggests that features within the watershed were severely affected by flood events in September of 2013 but have continued to stabilize since. For the purposes of presenting a period of record for the study area, the analysis of data from 2011 through 2018 will be presented where applicable/available in the following sections, in maps, and other figures.

A-4.1 Pueblo Canyon Background Area above the Wastewater Treatment Facility

The Pueblo Canyon background area above the Los Alamos County wastewater treatment facility (WWTF) upstream extent is west of the western edge of reach P-2 West (P-2W), and the eastern extent is downstream of the furthest downstream former cross-vane structure (Figure A-1.0-1).

Because no mitigiation controls exist in this section of the reach, monitoring is only conducted through the use of light detecting and ranging (LiDAR). No ground-based surveying has been conducted in this area since the 2014 monitoring year. A 3-yr geomorphic detection analysis published in the “2017 Monitoring Report for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project” demonstrated that net sediment deposition likely occurred within the Pueblo Canyon background monitoring area from 2014 to 2016 and did not identify any erosive features(see Attachment A-3 in LANL 2018, 603023).

A-4.2 Pueblo Canyon Upper Willow Planting Area

The upper willow planting area extends from the western edge of reach P-3 Far West (P-3FW) to the eastern edge of reach P-3 West (P-3W) (Figure A-4.2-1).

In 2018, the channel banks in this area were visually inspected or surveyed in small sections by the field team and show no changes from 2017 (Figure A-4.2-1). Bank tops in this section were first surveyed in 2013. Between 2013 and the next survey in 2015, the north bank top at the western extent of this section migrated to the south and remains as unconsolidated sediment on steep bedrock (Figure A-4.2-2). Because of the unstable nature of these overhanging slump blocks and dense vegetation along the banks, small sections, particularly on the south bank top, were not surveyed. All other sections of the bank tops have remained stable since 2013. Slight differences between the bank surveys from year to year are attributed to different interpretations of what constituted the most important breaks in slope between surveys and do not reflect bank erosion or deposition unless otherwise noted.

Both the map view (Figure A-4.2-1) and gradient of the thalweg profile (Figure A-4.2-3) show that no major departures of the channel thalweg occurred between 2017 and 2018. Notable changes to both the lateral position and the thalweg gradient occurred between 2012 and 2014 as a result of bank cutting and channel erosion during and immediately following the 2013 flood event (LANL 2015, 600439). A comparison of the available thalweg profiles since 2012 show incision occurred as a result of the flood in 2013 and that small lateral shifts and deposition have occurred to establish a preferred thalweg pathway since 2014 with the help of willows that attenuate flood energy and promote local channel stability/aggradation (Figure A-4.2-4).

Overall, the Pueblo Canyon upper willow planting area has been geomorphically stable since 2015. Geomorphic changes to channel bank tops and the primary thalweg between 2011 and 2014 were a result of flooding in 2013 that eroded the channel in this section of the study area and have reestablished themselves over time.

A-4.3 Pueblo Canyon Wing Ditch Area

The wing ditch area is a short distance downstream of the road leading to the Los Alamos County WWTF in reaches P-3 Central (P-3C) and P-3 East (P-3E). Since the removal of the wing ditch in 2015, no functional erosion control features exist in this section of the reach.

In 2018, the channel banks in this area were visually inspected or surveyed in small sections by the field team and show no changes from 2017 (Figure A-4.3-1). Bank tops above the culverts were first surveyed in 2016. Erosion in the form of channel incision, identified during the 2016 season in the channel west of the culverts, has likely been occurring since the 2013 flooding event (see photos A1-1 and A1-2 in Attachment A-1). The input of flood sediments provided a new substrate for the development of a meandering stream channel given the relatively low gradient of the reach (see Attachment A-3 in LANL 2018, 603023). The growth of reed canary grass, minor bank collapse and channel incision below the culverts have created a broad, braided channel system with no defined banks to survey.

This section of thalweg surveyed in 2018 demonstrate that the lateral position of this feature did not change in the section above the culverts between 2017 and 2018 (Figure A-4.3-1). The primary thalweg in the reed canary grass area downstream of the culverts was surveyed until the channel became braided to the point that no primary thalweg could be identified. Because the channel is poorly defined with frequent branching and distributed flow, changes to the lateral position of the thalweg below the culverts are common and reflected in changes to the gradient since 2012 (Figures A-4.2-3 and A-4.2-4).

Overall, the Pueblo Canyon wing ditch area has continued to reestablish itself since the flood event in 2013. Between 2014 and 2018, channel incision occurred in the western section of the study area. During that timeframe, minor aggradation occurred west of the incised channel and deposition continues to occur, typically as small side-channel inputs or depositional pockets from nearby eroded banks. Erosion within this channel over time may indicate the presence of a developing headcut (Attachment A3 in LANL 2018, 603023) as the channel continues to reestablish its flow path. The observed processes are typical of a recently flooded channel and are indicative of a system that will remain geomorphically stable in low-energy flows.

A-4.4 Pueblo Canyon Lower Willow Planting Area

The Pueblo Canyon lower willow planting area is within reaches P-3 Far East (P-3FE) and P-4 West (P-4W) in an area where willows were planted in 2014.

Comparison of the 2017 and 2018 surveyed channel bank tops, and small visually inspected sections on the northwest edge of the north bank top, demonstrate that the bank positions have not changed between survey years but that minor slumping of unconsolidated material has occurred in some places (Figure A-4.4-1; photos A1-3 and A1-4 in Attachment A-1). These results are consistent going back to 2013 after flooding caused an existing headcut in this area (near gage station E059.8) to propagate upstream, dramatically changing both the banktop and thalweg features (Figure A-4.4-2). Erosional and depositional events at different locations throughout the lower willow planting area resulted in lateral bank migration, ultimately widening the channel and changing the overall geomorphology of this section of the study area. In 2014, a concrete drop structure was built to prevent further headcut erosion and consecutive bank top surveys have demonstrated that these features have stabilized since this construction (Figure A-4.4-2).

Thalweg surveys were conducted in 2018 along the entire length of the Pueblo Canyon lower willow planting area. Both the map view (Figure A-4.4-1) and gradient of the thalweg profile (Figure A-4.4-3) show that the thalweg remained unchanged between the 2017 and 2018. Repeat surveys of this section of the study area conducted since 2013 show that numerous departures in the lateral position of the thalweg occurred between 2013 and 2015. During this time, major construction to build the drop structure and erosion mitigation projects involving reed canary grass planting took place; both of which helped to concentrate the flow of runoff into a defined channel over time (Figure A-4.4-2; Attachment A-3 in LANL 2018, 603023). The gradient of the channel thalweg in 2018 lies slightly above the 2015 gradient along the majority of this section of the channel demonstrating that very small amounts of deposition have occurred since 2015. Small differences in the “noise” of the profile lines are attributed to an increase in the density of survey points and the differential settling of the survey staff into the wetland substrate, rather than real topographic changes (Figure A-4.4-4).

Overall, the Pueblo Canyon lower willow planting area experienced minor reworking in the form of channel incision and side-channel input until 2016, there have been no observable changes since. Major changes to the geomorphology of the channel bank tops and primary thalweg in this section of the study area occurred as a result of flooding in 2013, propagating the headcut upstream and dramatically widening the channel. Erosion control measures installed in 2014 continue to establish a preferred flow path and prevent upstream migration of the previously exploited headcut.

A-4.5 Pueblo Canyon Grade-Control Structure Area

The Pueblo GCS area is within reach P-4 Central (P-4C) and reach P-4 East (P-4E).

Comparison of the 2017 and 2018 surveyed channel bank positions demonstrates the bank positions remain stable and unchanged above the GCS (Figure A-4.5-1). Similar to the lower willow planting area, there is a dramatic widening of the channel after the flood in 2013. Since then, other small changes to channel morphology have occurred where side channels have developed, and construction efforts to create bank stabilization below the GCS took place (LANL 2016, 601433; LANL 2017, 602343). Breaks in the survey data are attributed to vegetation blocking access to the bank top or slumping of unconsolidated material so that no distinct break in slope is present (Figure A-4.4-2).

There was little change in the thalweg pathway between 2017 and 2018 in the western portion of reach P-4C (Figure A.4-5-1). However, incision of the main channel is evident in the thalweg gradient profile and repeat photographs (Figure A.4-5.3; see photos A1-5 and A1-6 in Attachment A-1). Subtle changes in the thalweg pathway (Figure A.4-5.2) and continous drops in thalweg elevation (Figure A.4-5.4) since 2015 support the idea that the development of a singular thalweg has been occurring in this portion of the reach since the flood event of 2013. A 3-yr geomorphic change detection analysis published in the “2017 Monitoring Report for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project” indicates that further thalweg migration in the upper part of reach P-4C could lead to the loss of steeply sloped bank material, where the channel turns abruptly to the south, during a larger runoff event (Attachment A-3 in LANL 2018, 603023).

Reach P-4E is dominated by a broad, braided channel system. Changes in the surveyed thalweg position in 2017 and 2018 are attributed to different parts of the braided channel system being occupied during low-flow versus storm-flow conditions (Figure A-4.5-1). Additionally, there has been no major change to the gradient of the channel thalweg during this time (Figure A-4.5-3). Since no permanent or singular channel development has been observed between 2013 and 2018 (Figure A-4.5-2), changes in the elevation of the thalweg are likely a result of lateral shifts over time (Figure A-4.5.4).

Overall, the Pueblo Canyon GCS area has remianed geomorphically stable since 2013 with only minor changes evident as the main thalweg reestablishes it pathway in the western part of reach P-4C and continues to change position over the braided portion of the channel surface in reach P-4E. Bank tops throughout this section of the study area have remained stable since 2013 as a result of several consecutive years of below-average rainfall and the addition of bank stabilization controls.

A-4.6 Upper Los Alamos Canyon Retention Basins

The upper Los Alamos Canyon sediment retention basins are located at the base of the drainage below Solid Waste Management Unit 01-001(f) (LA-SMA-2 or Hillside 140) and are shown in Figure A-1.0-1. Visual inspections of these retention basins concluded that no detectable change occurred between 2017 and 2018. Erosion pin data indicate that extrememly minor and localized sediment input of +0.01 to +0.03 in. occurred during 2018.

A-4.7 Los Alamos Canyon Low-Head Weir

The Los Alamos Canyon low-head weir is located above the confluence with Pueblo Canyon, near the intersection with NM 4 and Omega Road shown in Figure A-1.0-1. No sediments were excavated during the 2017 to 2018 time period.

A-4.8 DP Canyon GCS Area

The DP Canyon GCS is located in reach DP-2.

Comparison of the 2017 and 2018 surveyed channel bank positions demonstrates the bank positions have not changed between survey years (Figure A-4.8-1). Since the baseline bank top survey was conducted in 2016, small sections have experienced minor slumping, causing breaks in the survey data, but have otherwise been stable (Figure A-4.8-2; photo A1-7 in Attachment A-1). Surveying of channel bank tops are not conducted in the central portion of this study area where it is dominated by a broad, braided channel system (photo A1-8 in Attachment A-1).

A continuous survey of the primary thalweg was conducted within the reach DP-2 area in 2018. There are short sections not surveyed where ice had frozen over the channel and points could not be taken. The surveyed thalweg shows no lateral departures occurred between 2017 and 2018 (Figure A-4.8-1). The gradient of the thalweg profile has also remained stable since 2017, except for a small portion on the western side of the study area where some sedimentation in the channel appears to have occurred (Figure A-4.8-3). Since 2012, changes to both the lateral position and gradient have occurred as a result of aggradation throughout the reach. The largest lateral departures occurred in the central portion of the study area between 2012 and 2014. From 2014 to 2016, the thalweg stabilized in an area south of where it previously occupied and has been stable since (Figure A-4.8.2). These lateral shifts are likely a result of overbank flows, which are typical during monsoon storm events. A comparison of the channel thalweg gradients also demonstrate that aggradation has occurred throughout most of the reach (Figure A-4.8-4). Although the lateral position of the thalweg seems to have stabilized over time, this trend of “filling in” the primary channel could possibly result in the reshaping of it, particularly where flow is confined to a narrow and deep channel (i.e., the western and eastern portions of the study area), as overbank flows become more common.

Overall, reach DP-2 in DP Canyon has been geomorphically stable since 2016. Slumping has occurred at small sections of the bank tops where unconsolidated material have eroded but are otherwise stable. Between 2012 and 2015, many lateral shifts of the thalweg position occurred. These shifts were particularly prevalent throughout the central section of the reach where overbank flow has created a braided channel system, but have stabilized since.

A-5.0 GEOMORPHIC SURVEYS DISCUSSION

The field-checked channel bank and thalweg surveys presented in this report demonstrate that these features continue to stabilize following the effects a large flood event in 2013 that modified much of the geomorphology in Los Alamos, DP, and Pueblo Canyons. Active processes that contribute to small observed changes since 2013 are characterized by typical arid-region mass wasting processes, specifcally minor slides, flows, slumps, and falls of unconsolidated sediment on steep bedrock or soil surfaces. Repeat surveying suggests that these areas will remain stable under the conditions experienced since 2014.

A-6.0 OBSERVATIONS AND MONITORING OF WILLOWS IN PUEBLO CANYON

Coyote willows (*Salix exigua*) were planted in Pueblo Canyon to aid in surface stabilization, reduce flow velocity, and encourage sediment accumulation (LANL 2016, 601433; LANL 2017, 602343). The willows were planted following requirements outlined by Appendix B of the “2014 Monitoring Report for Los Alamos/Pueblo Watershed Transport Mitigation Project” (LANL 2015, 600439). Baseline qualitative monitoring of these willows in Pueblo Canyon was first conducted in November of 2016 and repeated in the fall of both 2017 and 2018.

A-6.1 Willow Monitoring Survey Methods

To monitor willow communities in Pueblo Canyon, average range of plant growth (height) and spatial distribution of willow populations were used to characterize and define discrete willow populations. Willow populations in Pueblo Canyon were divided into five distinct communities based on measurements of individual willows for growth (height and basal diameter) and stand growth habit (spatial distribution). Height and basal-diameter measurements were used as the metrics representative of growth stage. Growth habit was qualitatively determined in the field by characterizing the spatial distribution of willow populations into one of two categories: continuous or dispersed. Continuous populations are defined as stands of willows where individuals overlap and take up greater than 50% of the total mapped area. Dispersed populations are defined as stands of willows where individuals do not overlap and make up less than 50% of the community area (Figure A-6.1-1). When willows within these communities are measured, new and sprouting willows less than 2 ft in height are not included because their viability has yet to be established. Additionally, repeat photographs are taken in order to show any observable change, or lack thereof, within discrete willow populations.

A-6.2 Willow Monitoring Survey Results

Table A-6.1-1 presents the qualitative data from willow community survey methods described in section A-6.1. Repeat photographs can be found in Attachment A-1.

Short-height, spatially dispersed (P-1) communities were found in areas dominated by sand/gravel bars where they have limited water access because of a deep water table. Short-height, spatially continuous (P-2) communities are usually found in sand/gravel-dominated areas with more consistent water access. Medium-height, spatially dispersed (P-3) communities were found within reed canary grass (*Phalaris arundinacea*) clusters and close to continuously saturated substrates. Medium-height, spatially continuous (P-4) communities were found in areas generally devoid of clusters of reed canary grass and other plant species and close to continuously saturated substrates. Tall-height, spatially continuous (P-5) communities were found along the channel axis and closest to more continuously saturated substrate that allows for vigorous growth and outcompeting of other vegetation.

While individual measurements of trees varied between 2017 and 2018, the data demonstrate that there were no observable changes in the Pueblo Canyon willow communities between these 2 survey yr (Attachment A-1). Since the willows were initially planted in 2014, the most observable growth has occurred in the P-5 communities where the willows grow along a typically saturated channel axis without competing reed canary grass. Repeat photos A1-9 and A1-10 show an observable decrease in competitive vegetation between 2016 and 2018 within at least one population of this community. Healthy growth has also been observed in the P-3 and P-4 communities, but especially so in the P-4 communities where there is less competition with canary grass. Repeat photos A1-11–A1-14 show an observable increase in the density and height of willows between 2016 and 2018 within at least one population of both P-3 and P-4 communities. The poorest growth has been observed in the P-1 and P-2 communities. The lack of growth in these communities is the result of a combination of sparse initial planting and lack of consistently saturated substrate, often because plantings were located on sand/gravel bars, away from the channel axis where the water table is much deeper. Repeat photos A1-15–A1-18 show little to no observable change within at least one population of P-1 and P-2 communities.

A-6.3 Willow Monitoring Survey Conclusions

Qualitative analyses of the willow communities in Pueblo Canyon indicate vegetative growth in this area is variable because of inconsistent discharge reaching the extent of the areas where willows are planted. Three main factors influenced successful growth of the willow communities: proximity to saturated substrate, original planting distribution, and competition with reed canary grass. A dry winter, lack of discharge from the WWTF and the monsoon season, being generally average to below average in its intensity of rainfalls, did not promote growth in any of the willow communities between 2017 and 2018. This is reflected in the lack of observable change during the 2018 survey of these communities.

Repeat surveys since 2016 have demonstrated that willow stands closer to the active channel and in typically saturated substrates have grown the most whereas those that were planted on sand/gravel bars where there is a lack of consistently saturated substrate have not grown as much. Overall, there have been no observed changes in the distribution or number of stands for the lower Pueblo Canyon willow communities between 2016 and 2018, suggesting that they will continue to attenuate flood energy and promote local channel stability/aggradation (Figure A-6.3-1).

A-7.0 REFERENCES AND MAP DATA SOURCES

A-7.1 References

The following reference list includes documents cited in this appendix. Parenthetical information following each reference provides the author(s), publication date, and ERID, ESHID, or EMID. This information is also included in text citations. ERIDs were assigned by the Laboratory's Associate Directorate for Environmental Management (IDs through 599999); ESHIDs were assigned by the Laboratory's Associate Directorate for Environment, Safety, and Health (IDs 600000 through 699999); and EMIDs are assigned by Newport News Nuclear BWXT-Los Alamos, LLC (N3B) (IDs 700000 and above). IDs are used to locate documents in N3B's Records Management System and in the Master Reference Set. The NMED Hazardous Waste Bureau and N3B maintain copies of the Master Reference Set. The set ensures that NMED has the references to review documents. The set is updated when new references are cited in documents.

LANL (Los Alamos National Laboratory), February 2011. "Baseline Geomorphic Conditions at Sediment Transport Mitigation Sites in the Los Alamos and Pueblo Canyon Watersheds, Revision 1," Los Alamos National Laboratory document LA-UR-11-0936, Los Alamos, New Mexico. (LANL 2011, 200902)

LANL (Los Alamos National Laboratory), May 2012. "2011 Geomorphic Changes at Sediment Transport Mitigation Sites in the Los Alamos and Pueblo Canyon Watersheds," Los Alamos National Laboratory document LA-UR-12-21330, Los Alamos, New Mexico. (LANL 2012, 218411)

LANL (Los Alamos National Laboratory), May 2015. "2014 Monitoring Report for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project," Los Alamos National Laboratory document LA-UR-15-21413, Los Alamos, New Mexico. (LANL 2015, 600439)

LANL (Los Alamos National Laboratory), April 2016. "2015 Monitoring Report for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project," Los Alamos National Laboratory document LA-UR-16-22705, Los Alamos, New Mexico. (LANL 2016, 601433)

LANL (Los Alamos National Laboratory), April 2017. "2016 Monitoring Report for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project," Los Alamos National Laboratory document LA-UR-17-23308, Los Alamos, New Mexico. (LANL 2017, 602343)

LANL (Los Alamos National Laboratory), April 2018. "2017 Monitoring Report for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project," Los Alamos National Laboratory document LA-UR-18-23237, Los Alamos, New Mexico. (LANL 2018, 603023)

NMED (New Mexico Environment Department), July 1, 2011. "Approval with Modifications, 2010 Geomorphic Changes at Sediment Transport Mitigation Sites in the Los Alamos and Pueblo Canyon Watersheds," New Mexico Environment Department letter to G.J. Rael (DOE-LASO) and M.J. Graham (LANL) from J.E. Kieling (NMED-HWB), Santa Fe, New Mexico. (NMED 2011, 204349)

A-7.2 Map Data Sources

Drainage; Los Alamos National Laboratory, Environment and Remediation Support Services; 1:24,000; May 15, 2006.

Gaging stations; Los Alamos National Laboratory, Waste and Environmental Services Division; 1:2,500; March 19, 2011.

Geomorphic Reach Boundaries (DP Canyon), Los Alamos National Laboratory, Earth and Environmental Science, GISLab, 1993

Geomorphic Reach Boundaries (LA Canyon), Los Alamos National Laboratory, Earth and Environmental Science, GISLab, 2000

Geomorphic Reach Boundaries (Pueblo Canyon), Los Alamos National Laboratory, Earth and Environmental Science, GISLab, 2004

Grade control structures; Los Alamos National Laboratory, Environment and Remediation Support Services; Unknown; May 17, 2011.

LANL boundary; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; Unknown; August 16, 2010.

LANL area orthophoto; Los Alamos National Laboratory, 2014.

Other property boundary; Los Alamos National Laboratory, Earth and Environmental Sciences GIS Lab; Unknown; August 16, 2010.

Roads, surfaced; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; Unknown; November 30, 2010.

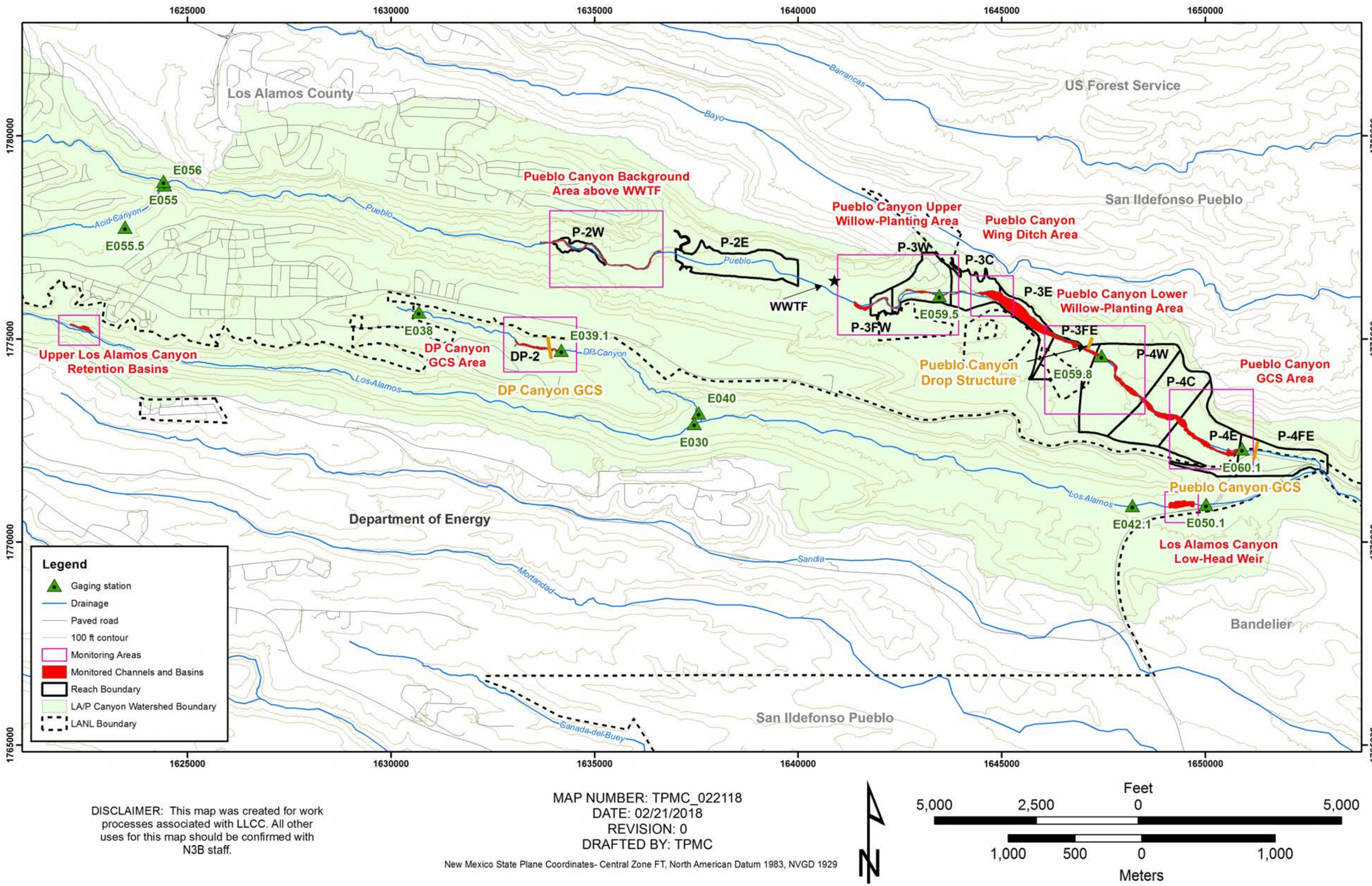


Figure A-1.0-1 Los Alamos, Pueblo, and DP Canyon channel systems showing sediment transport monitoring areas, monitoring area extents, and stream gages

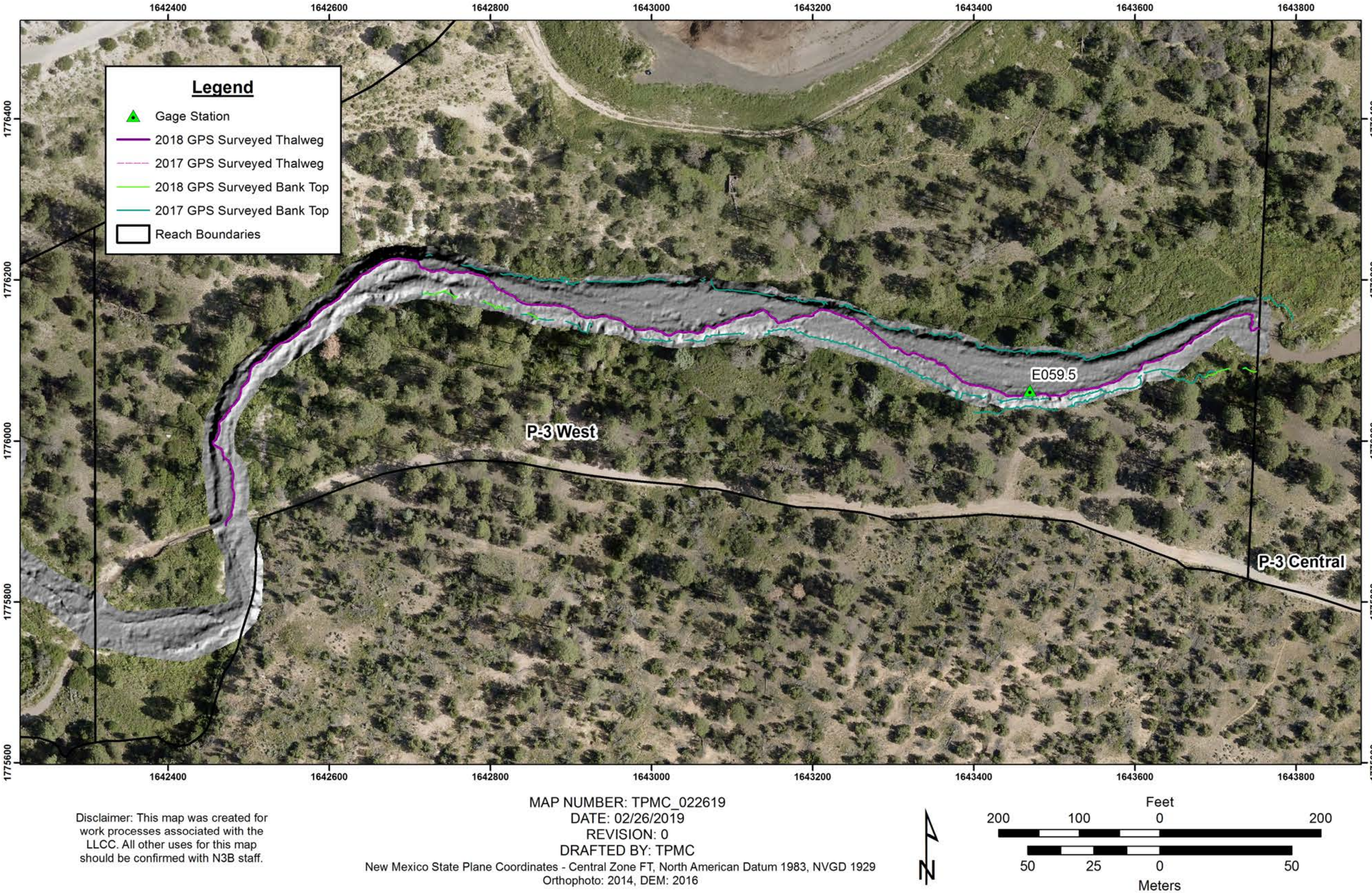


Figure A-4.2-1 2014 Orthophoto with 2016 hillshade digital elevation model (DEM) and 2018 vs 2017 channel banks and thalweg surveys at the Pueblo Canyon upper willow planting area

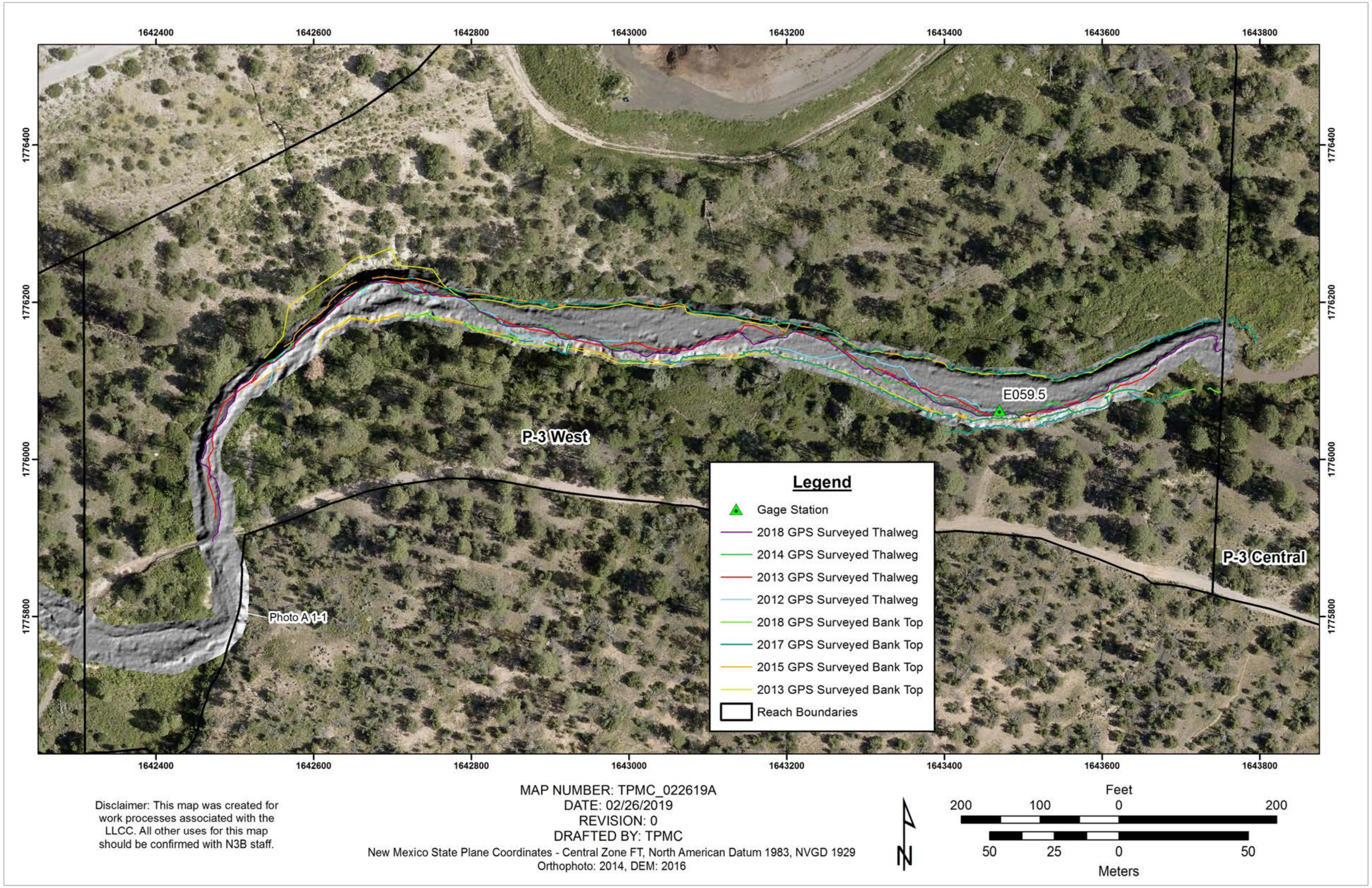


Figure A-4.2-2 **2014 Orthophoto with 2016 hillshade DEM and period of record comparison of channel banks and thalweg surveys at the Pueblo Canyon upper willow planting area**

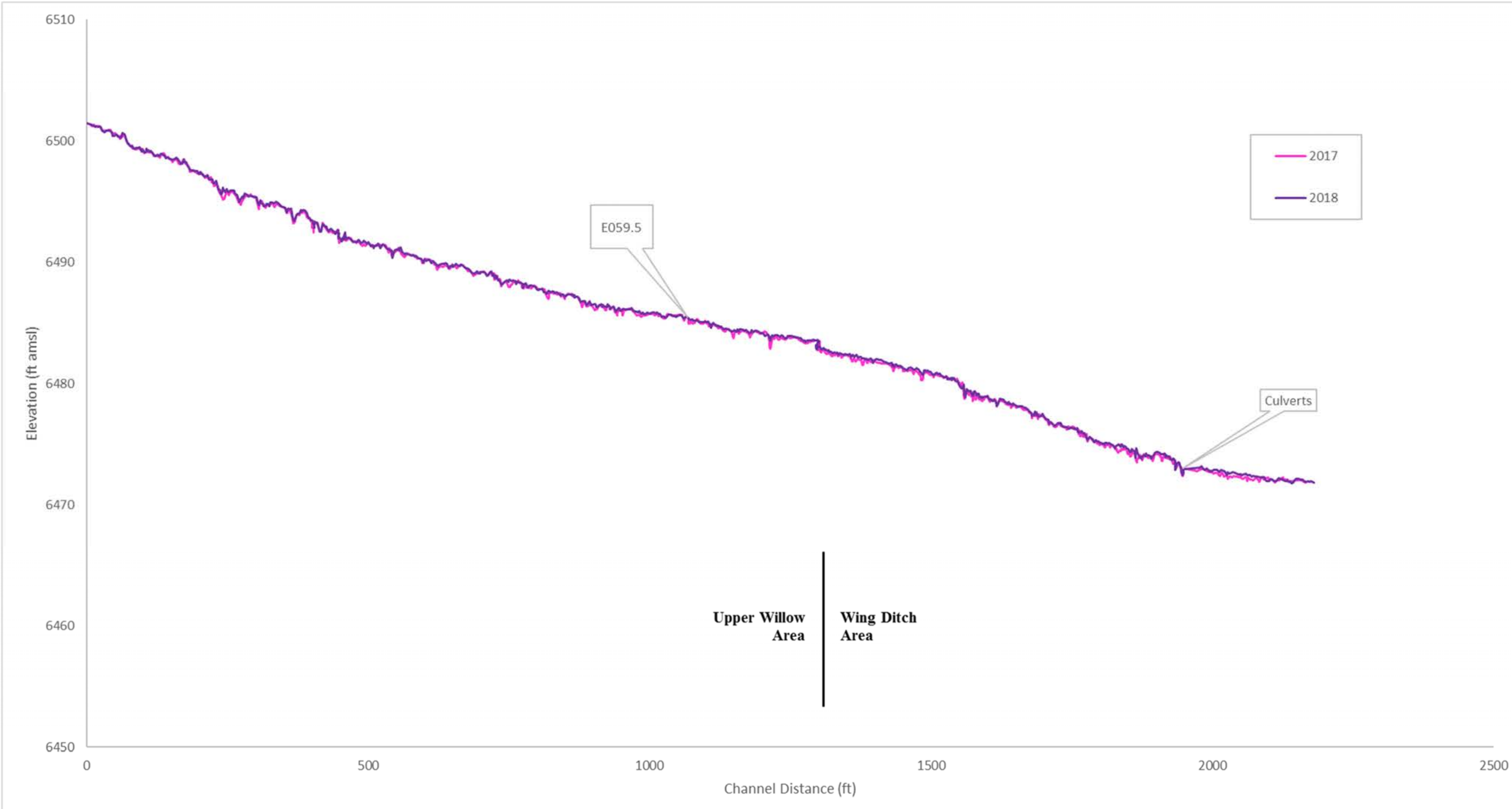


Figure A-4.2-3 1-yr Thalweg profile comparison in Pueblo Canyon of the upper willow planting and wing ditch areas (22 times vertical exaggeration)

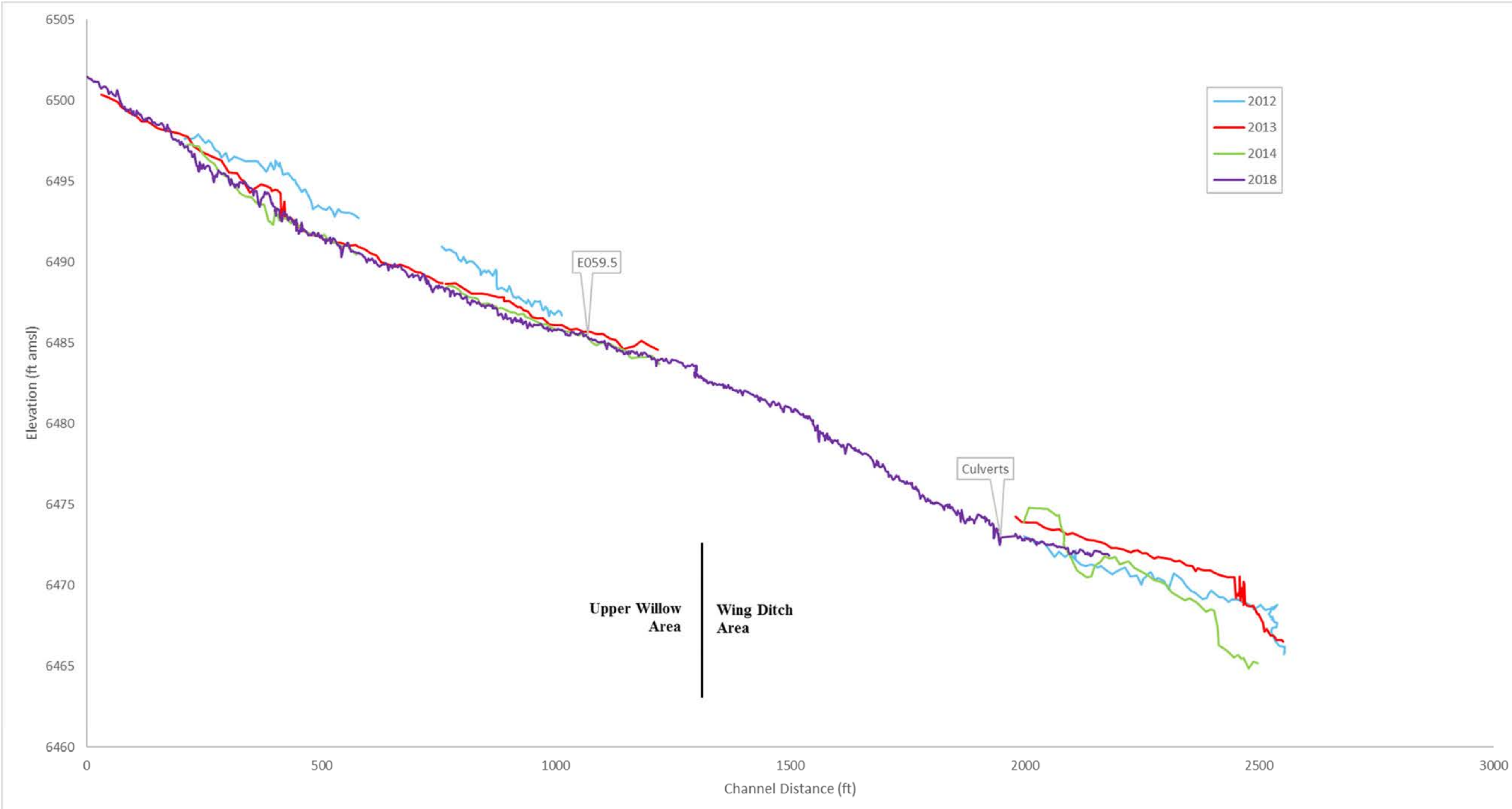


Figure A-4.2-4 Period of record Thalweg profile comparison in Pueblo Canyon of the upper willow planting and wing ditch areas (33 times vertical exaggeration)

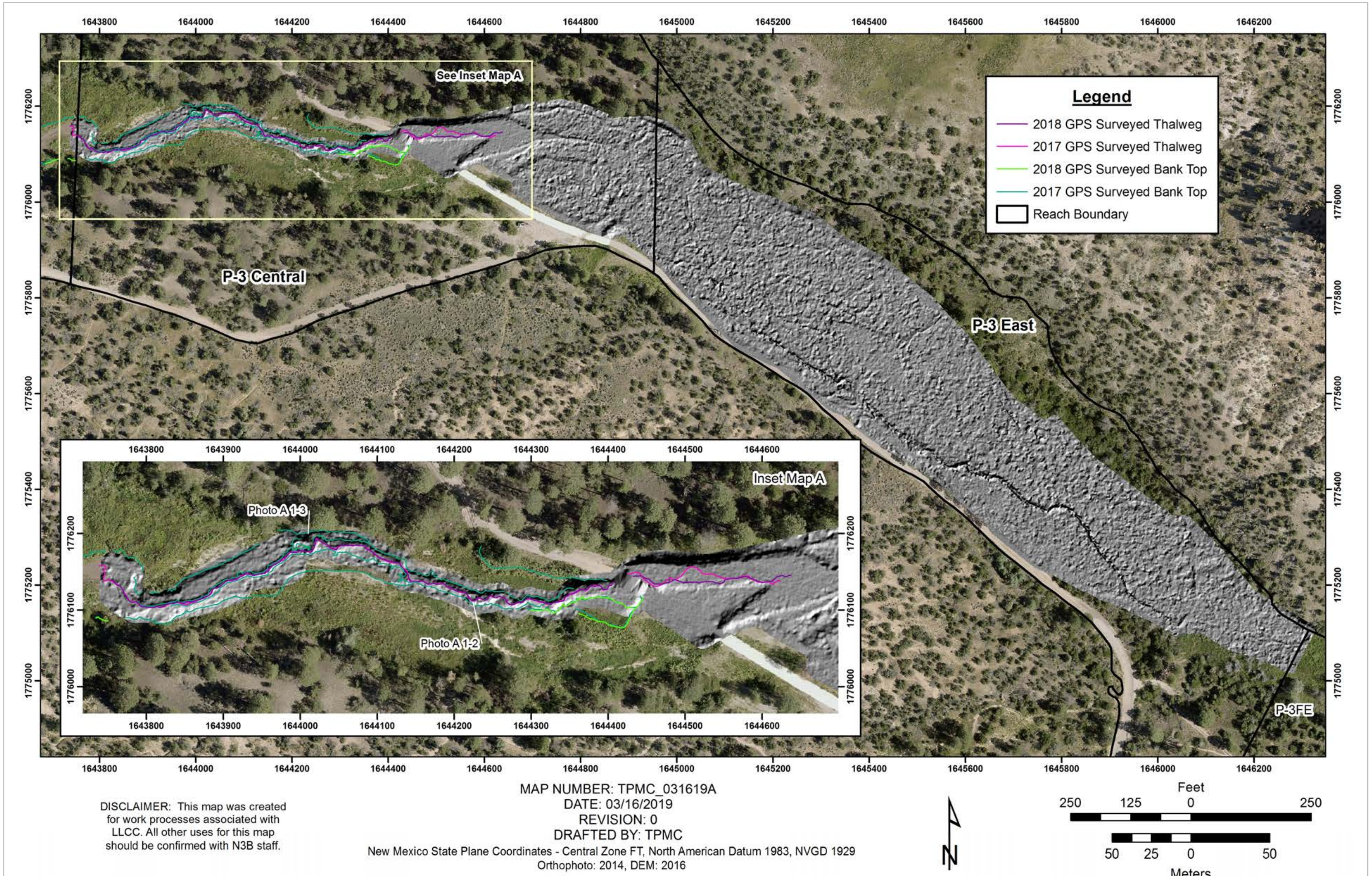


Figure A-4.3-1 2014 Orthophoto with 2016 hillshade DEM and 2017 vs. 2018 surveyed channel banks and thalweg at the Pueblo Canyon wing ditch area

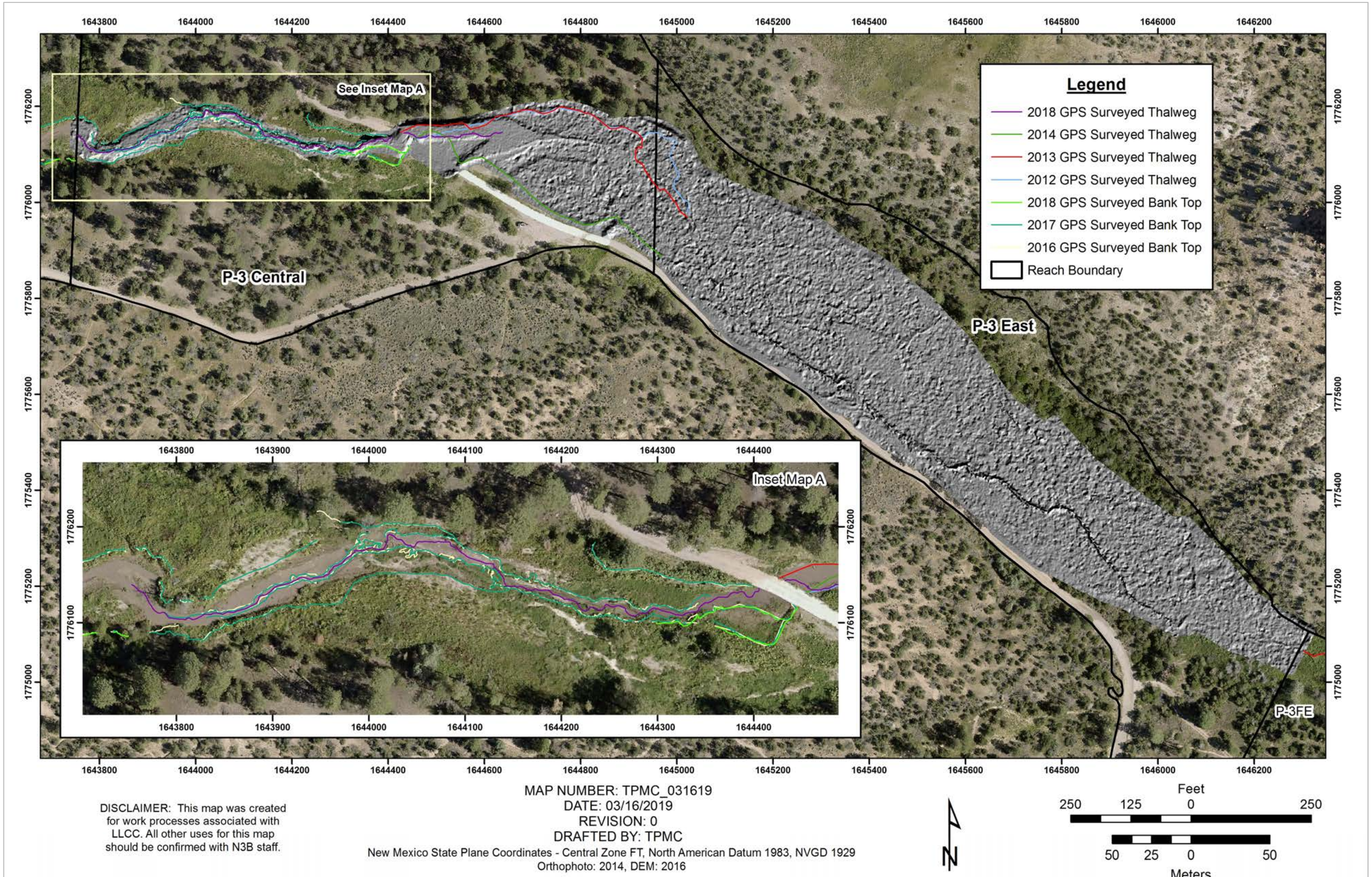


Figure A-4.3-2 2014 Orthophoto with 2016 hillshade DEM and period of record comparison of channel banks and thalweg surveys at the Pueblo Canyon wing ditch area

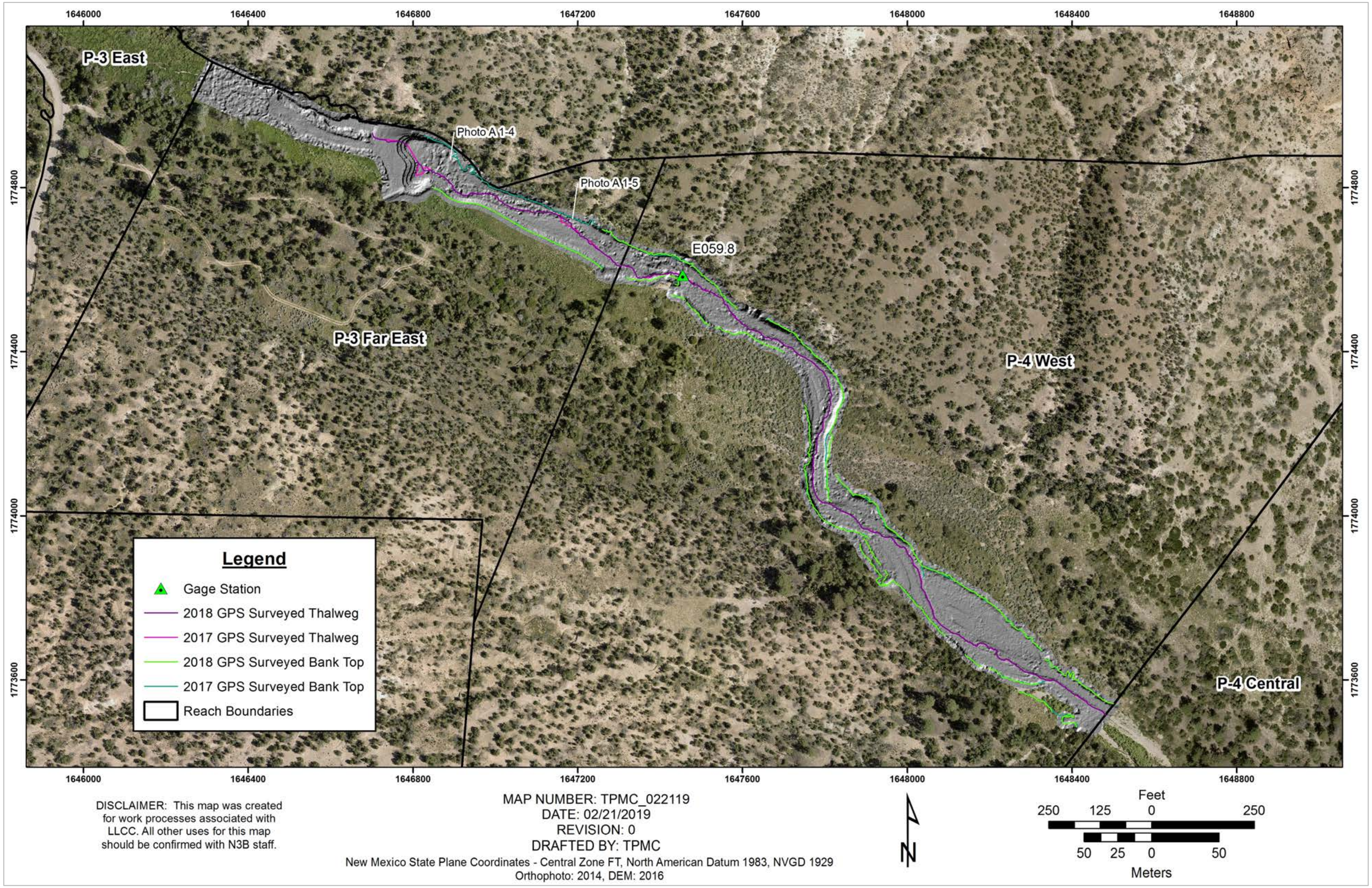


Figure A-4.4-1 2014 Orthophoto with 2016 hillshade DEM and 2017 vs. 2018 surveyed channel banks and thalweg at the Pueblo Canyon lower willow planting area

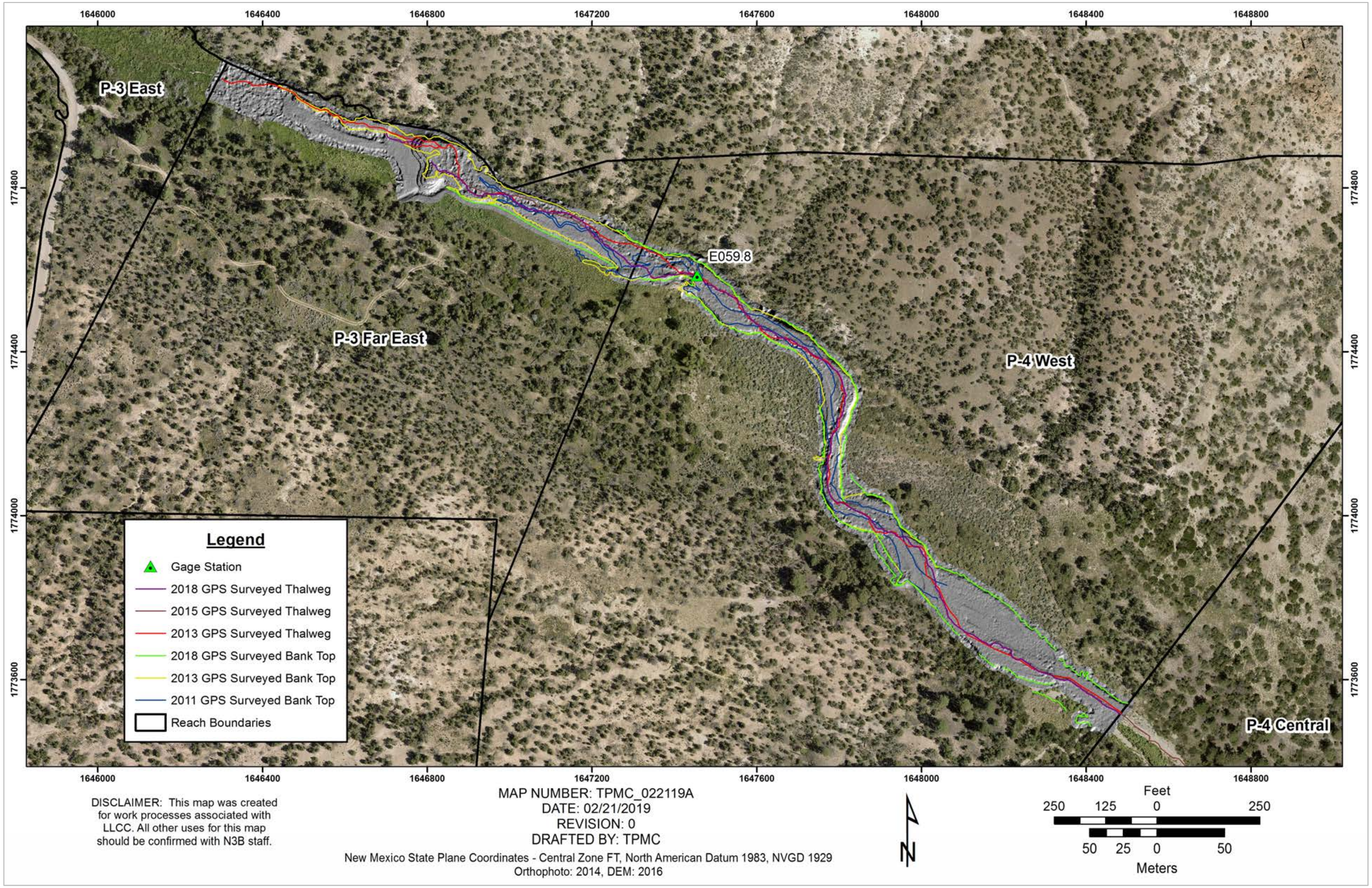


Figure A-4.4-2 **2014 Orthophoto with 2016 hillshade DEM and period of record comparison of channel banks and thalweg surveys at the Pueblo Canyon lower willow planting area**

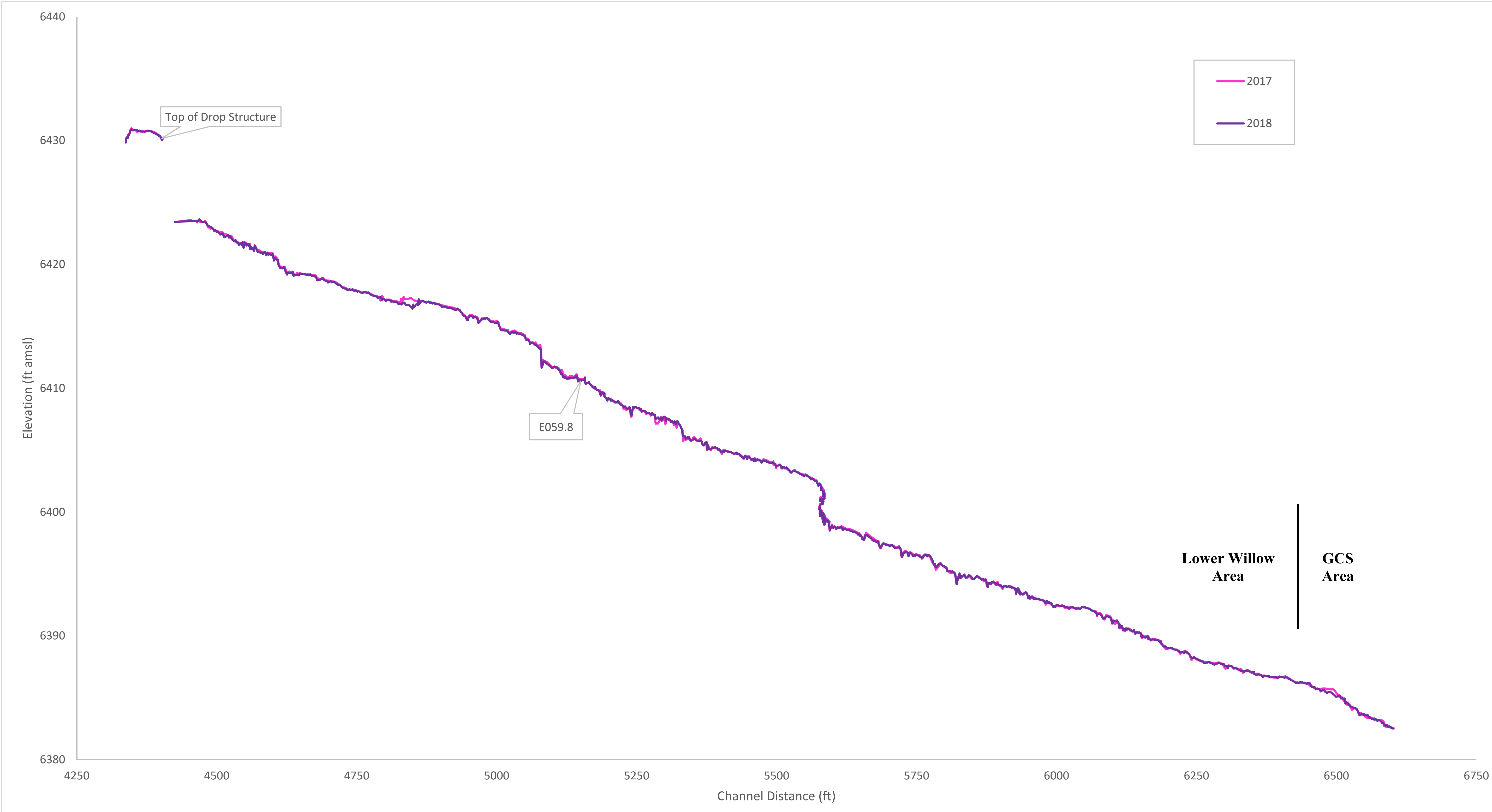


Figure A-4.4-3 1-yr Thalweg profile comparison in Pueblo Canyon of the lower willow planting area (23 times vertical exaggeration)

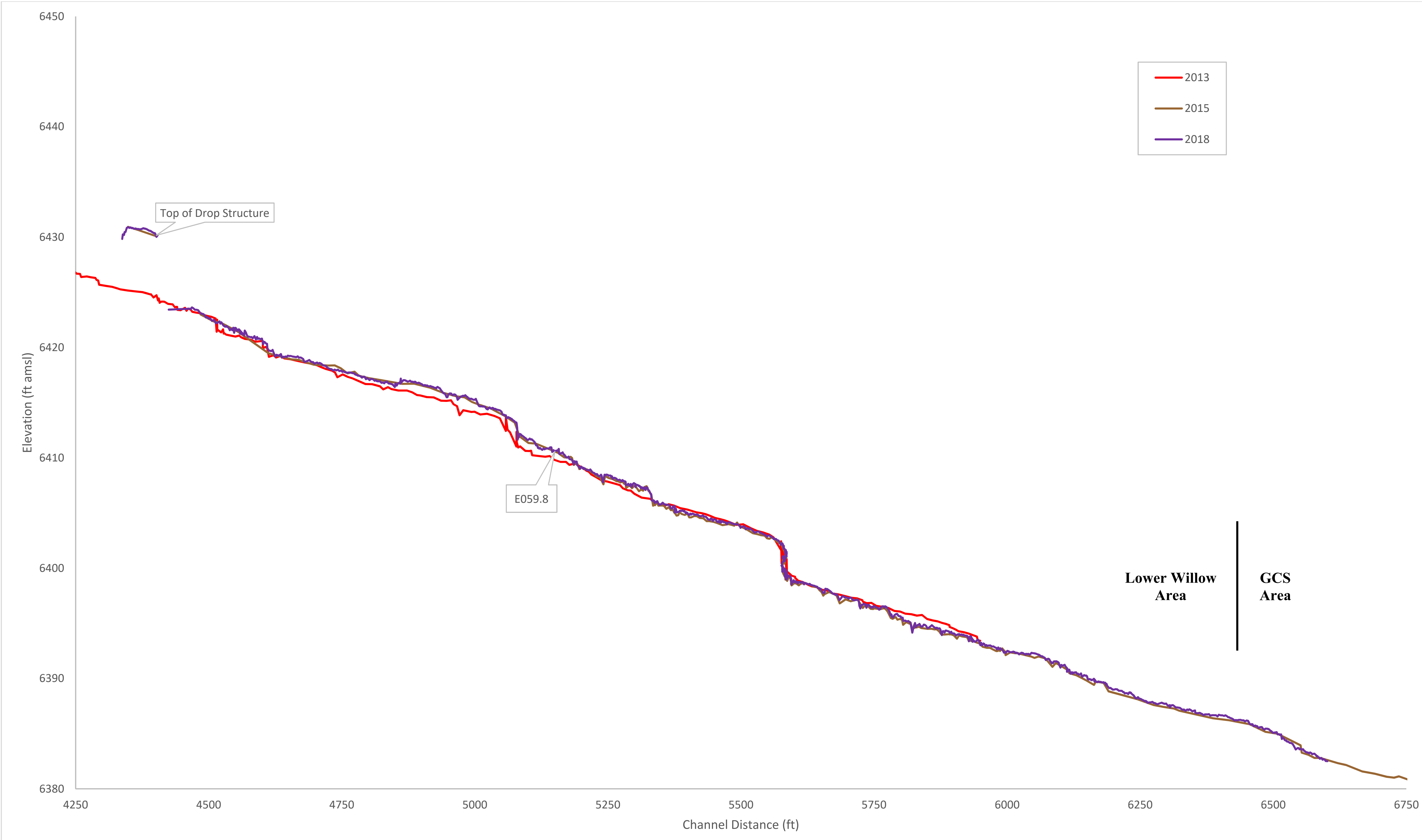


Figure A-4.4-4 **Period of record Thalweg profile comparison in Pueblo Canyon of the lower willow planting area (21 times vertical exaggeration)**

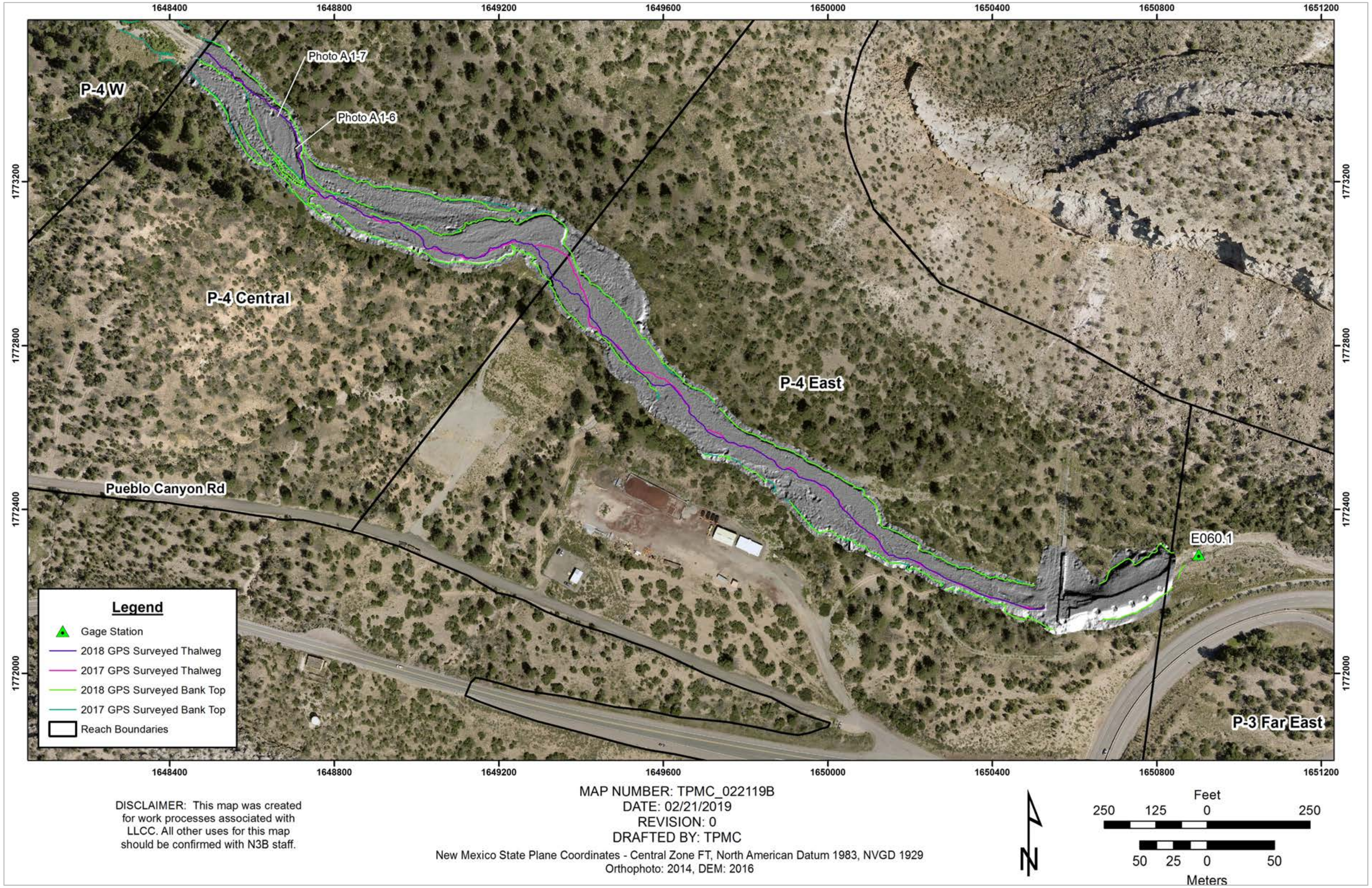


Figure A-4.5-1 **2014 Orthophoto with 2016 hillshade DEM and 2017 vs. 2018 surveyed channel banks and thalweg at the Pueblo Canyon GCS area**

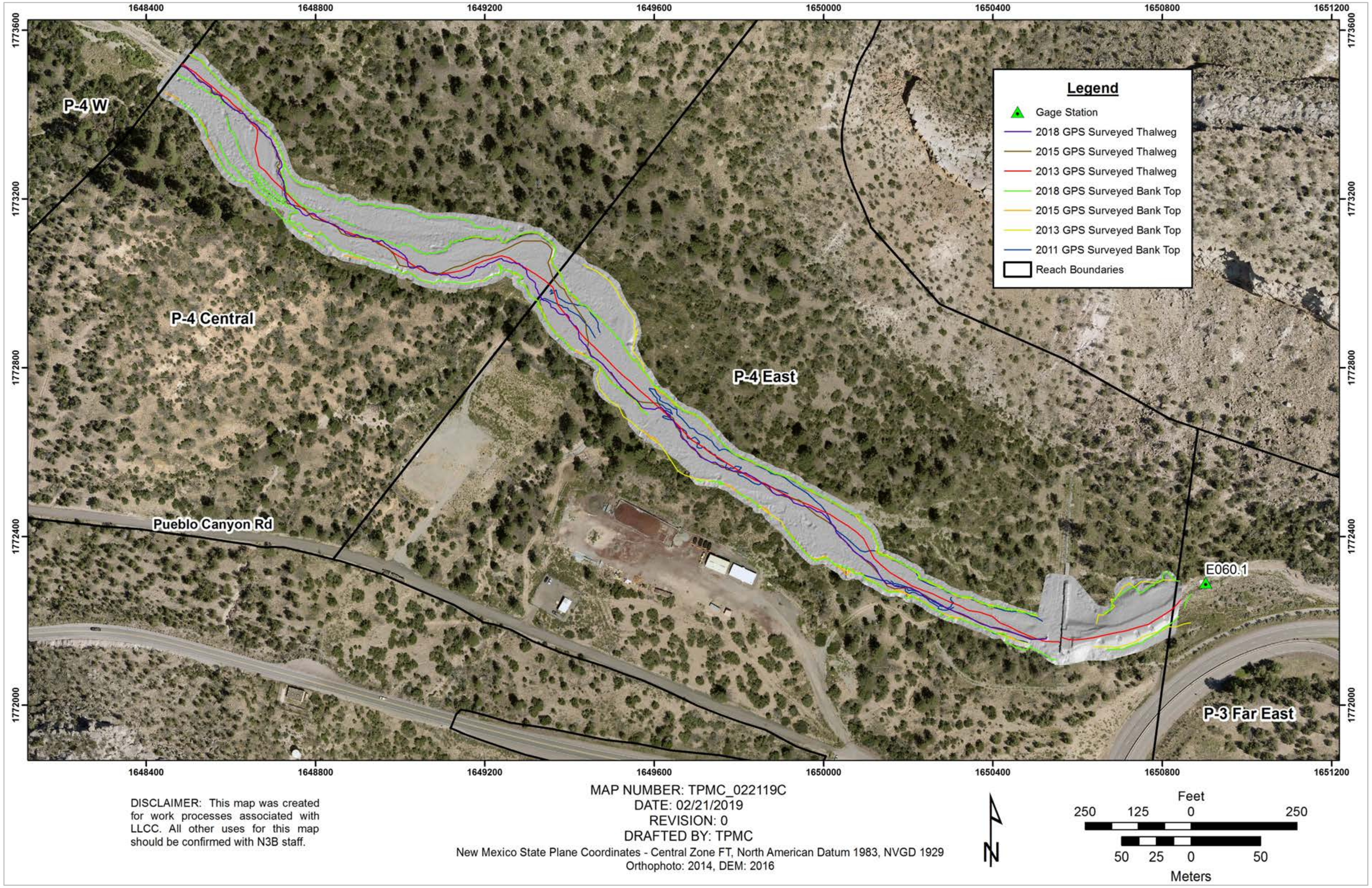


Figure A-4.5-2 **2014 Orthophoto with 2016 hillshade DEM and period of record comparison of surveyed channel banks and thalweg at the Pueblo Canyon GCS area**

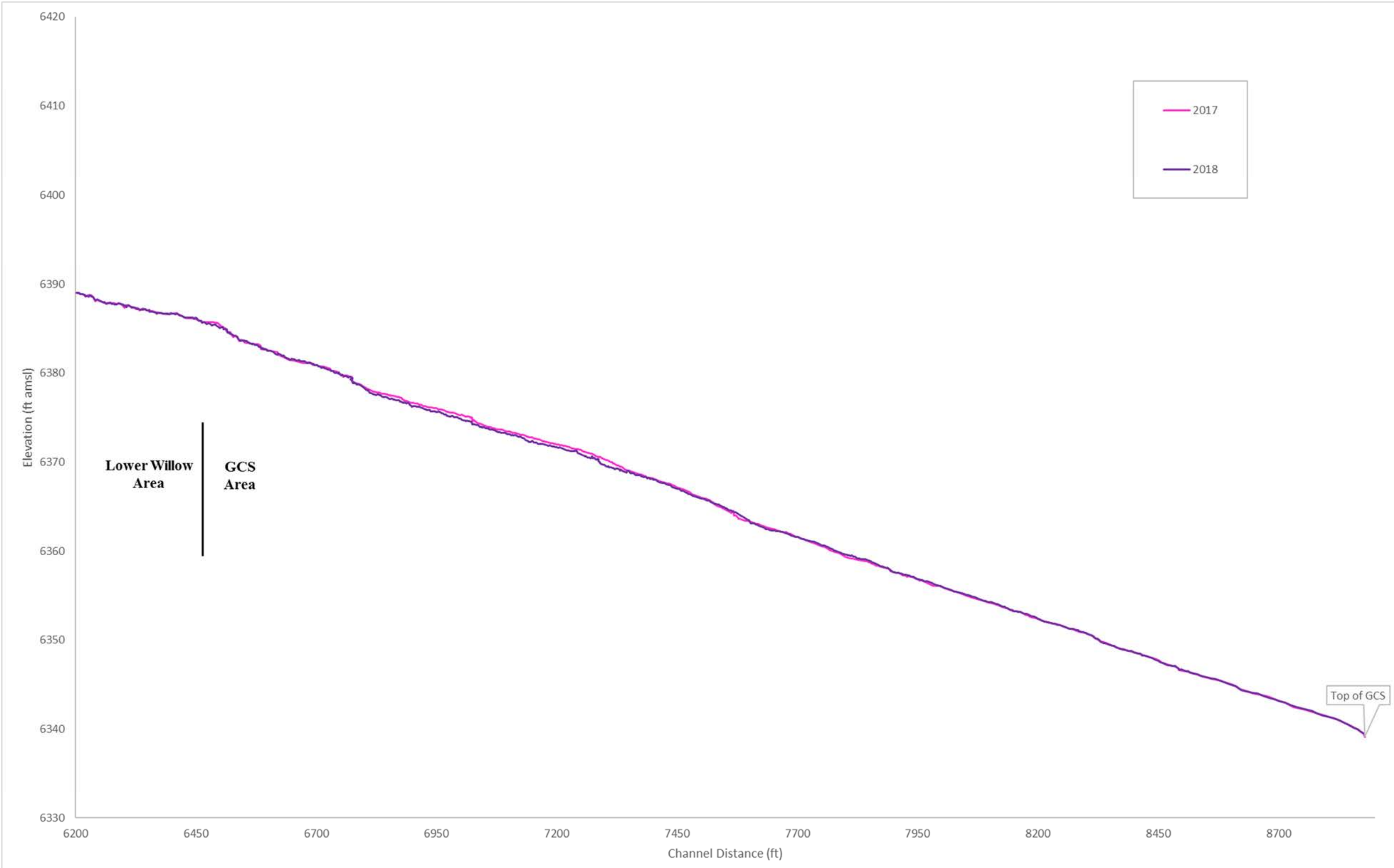


Figure A-4.5-3 **1-yr Thalweg profile comparison in Pueblo Canyon of the GCS area (19 times vertical exaggeration)**

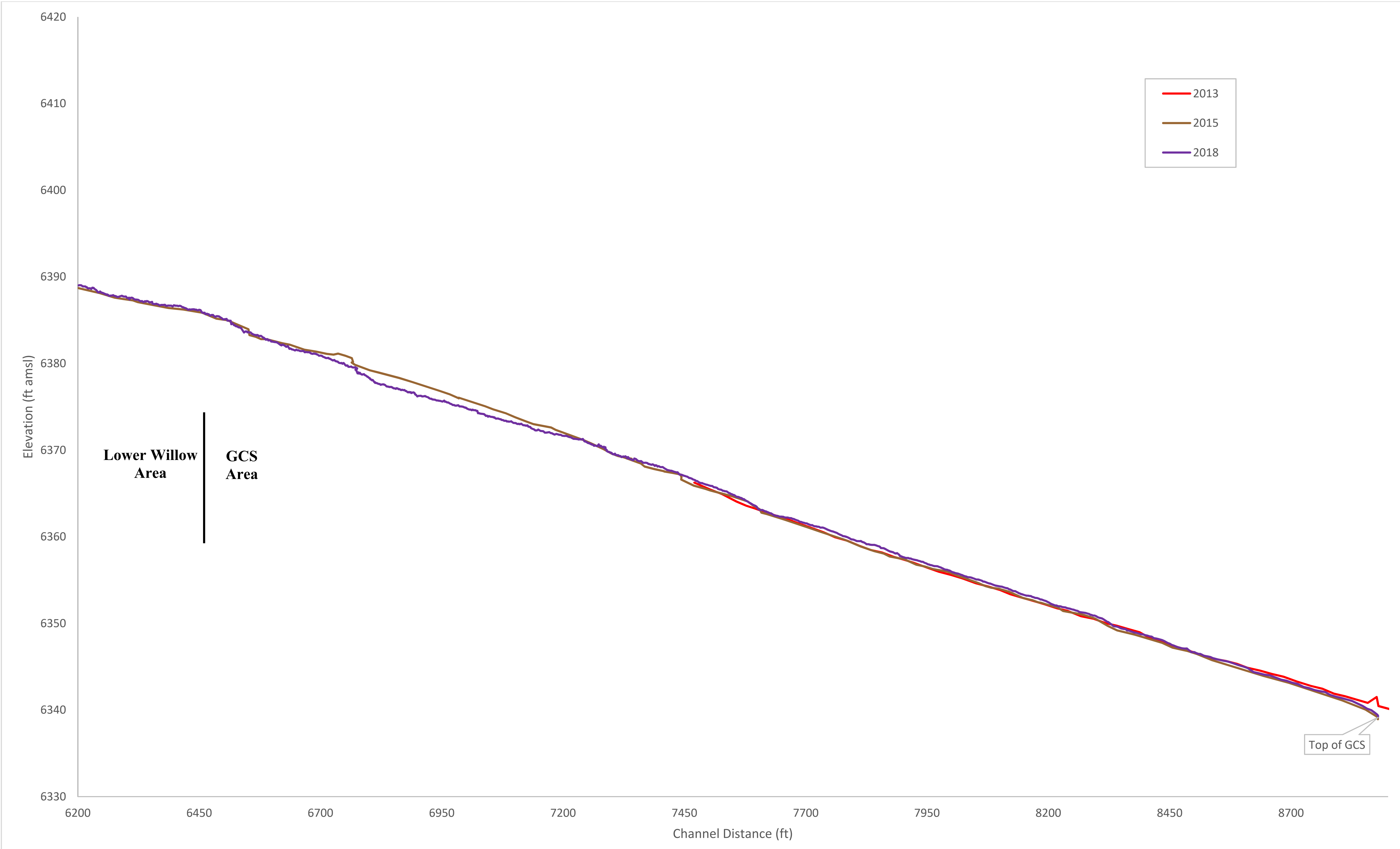


Figure A-4.5-4 Period of record Thalweg profile comparison in Pueblo Canyon of the GCS area (18 times vertical exaggeration)

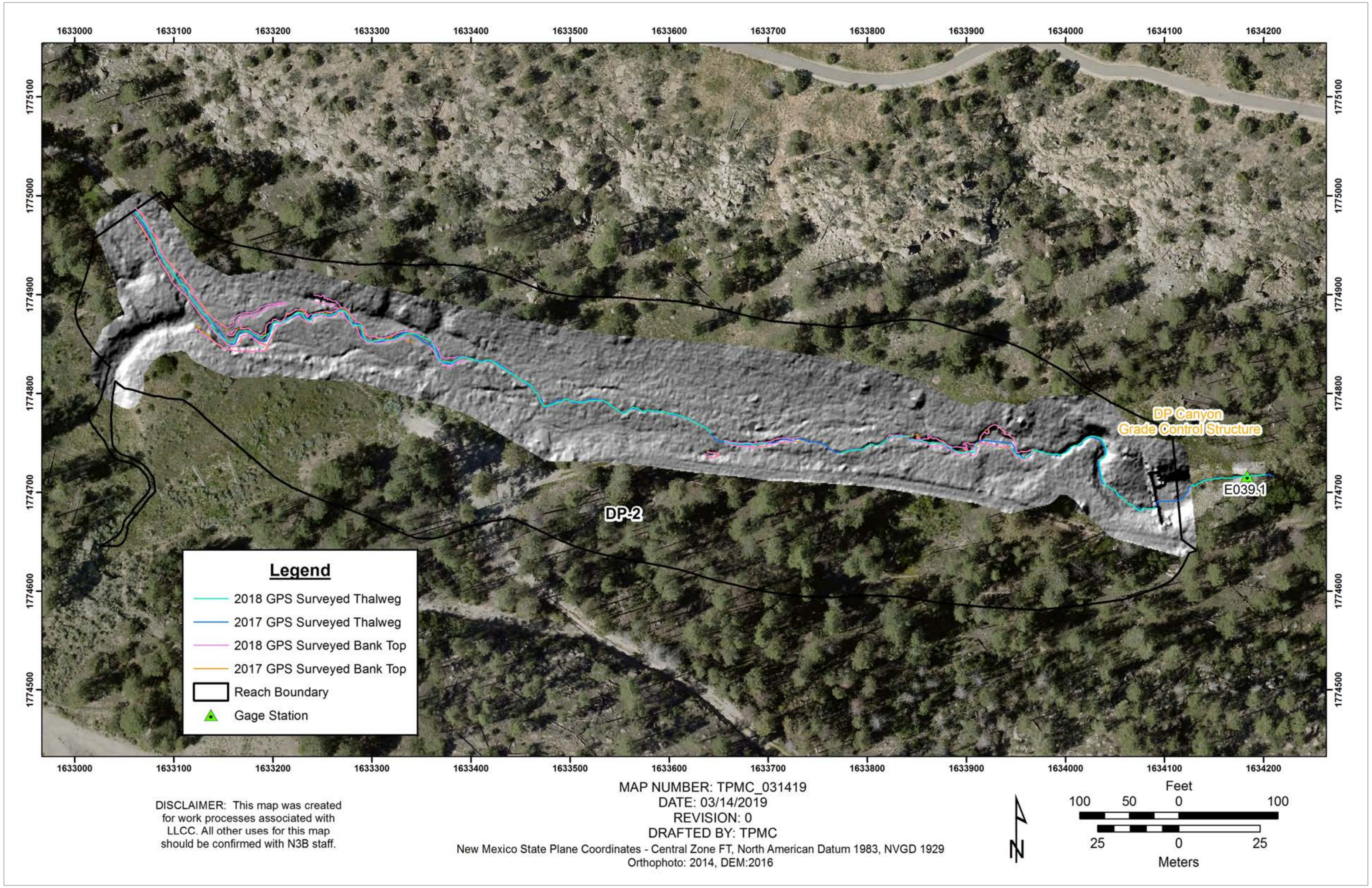


Figure A-4.8-1 2014 Orthophoto with 2016 hillshade DEM and 2017 vs. 2018 surveyed channel bank and thalweg surveys at the DP Canyon GCS area

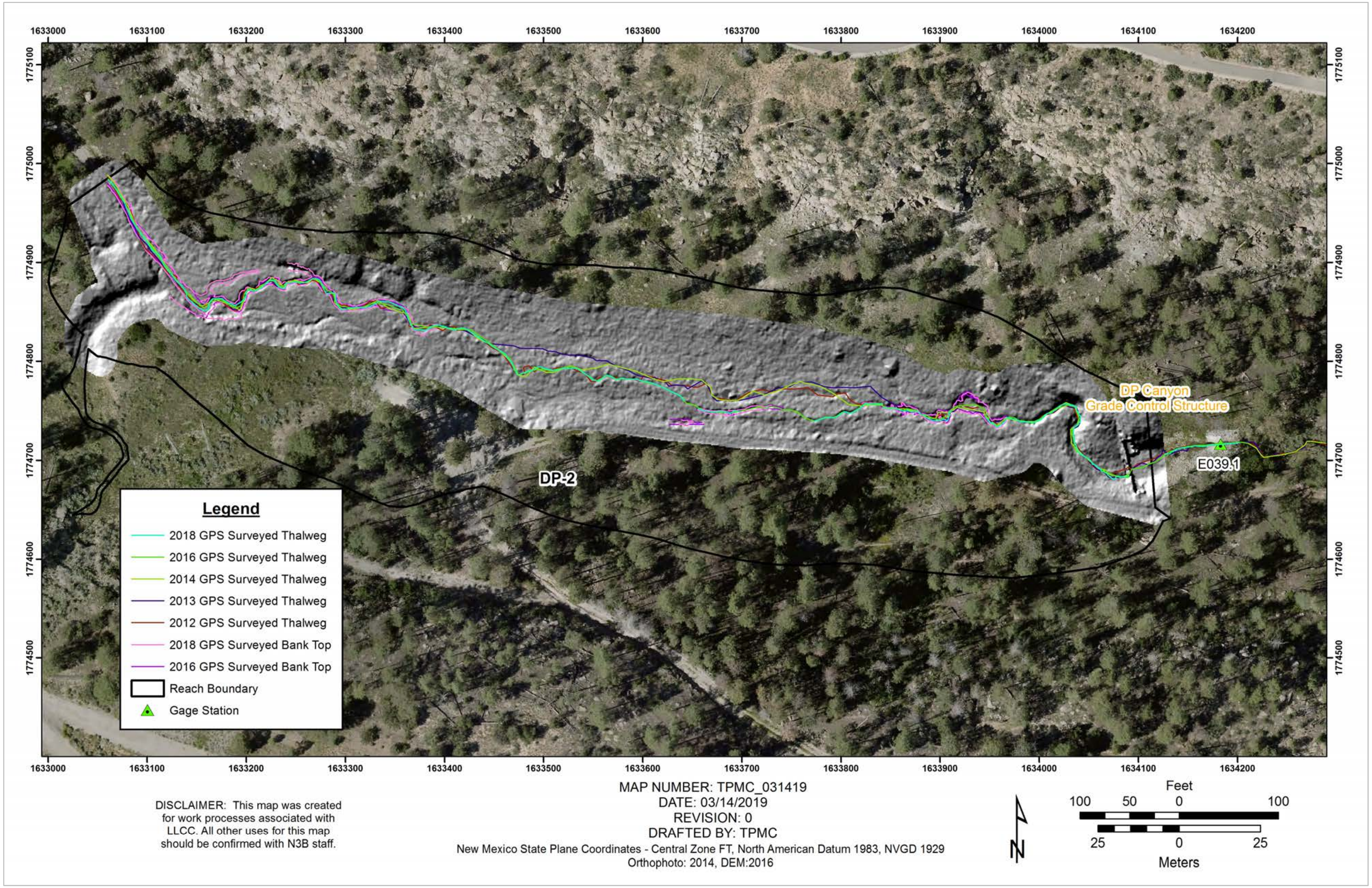


Figure A-4.8-2 2014 Orthophoto with 2016 hillshade DEM and a period of record comparison of the channel bank and thalweg surveys at the DP Canyon GCS area

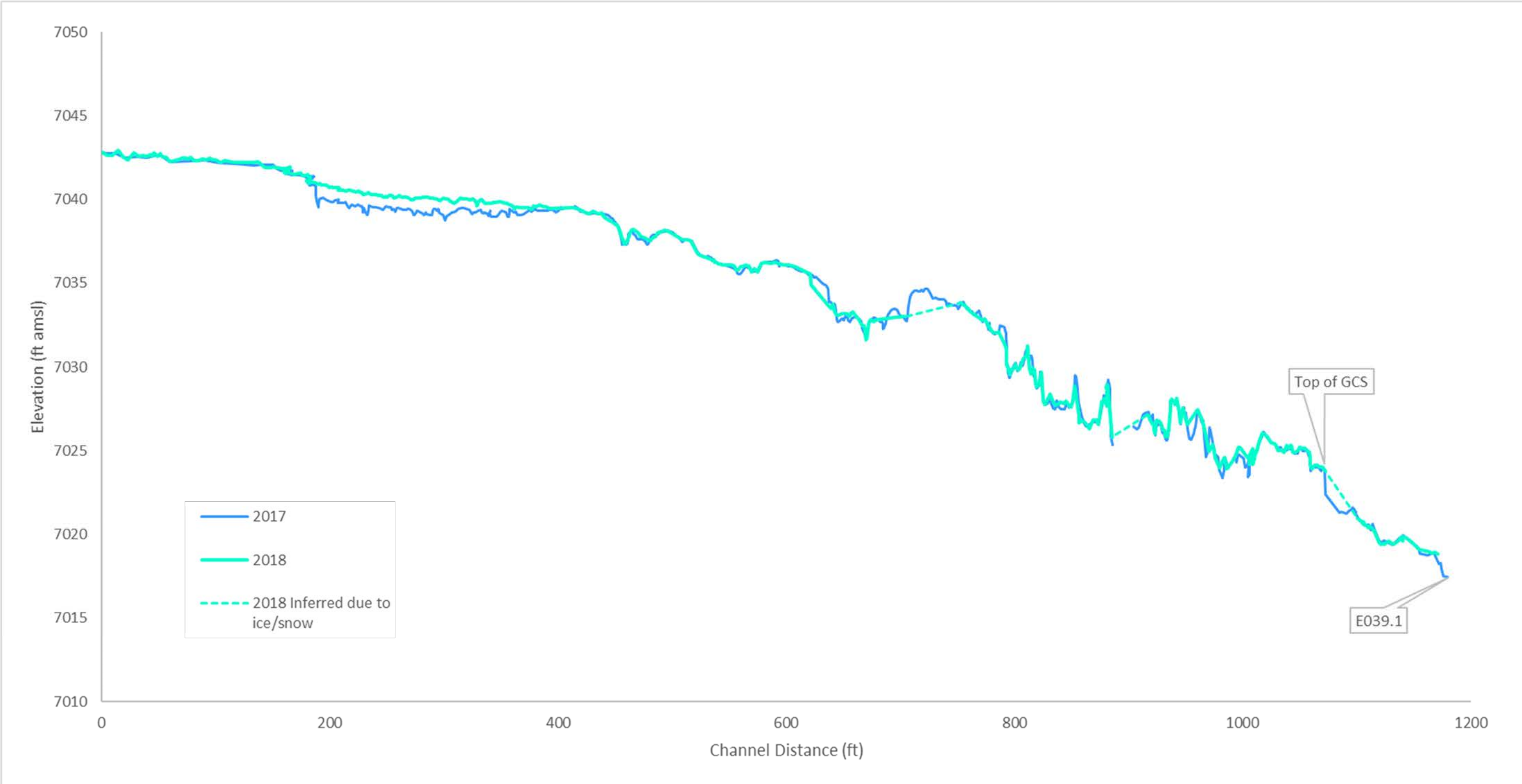


Figure A-4.8-3 **1-yr Thalweg profile in DP Canyon GCS area (15 times vertical exaggeration)**

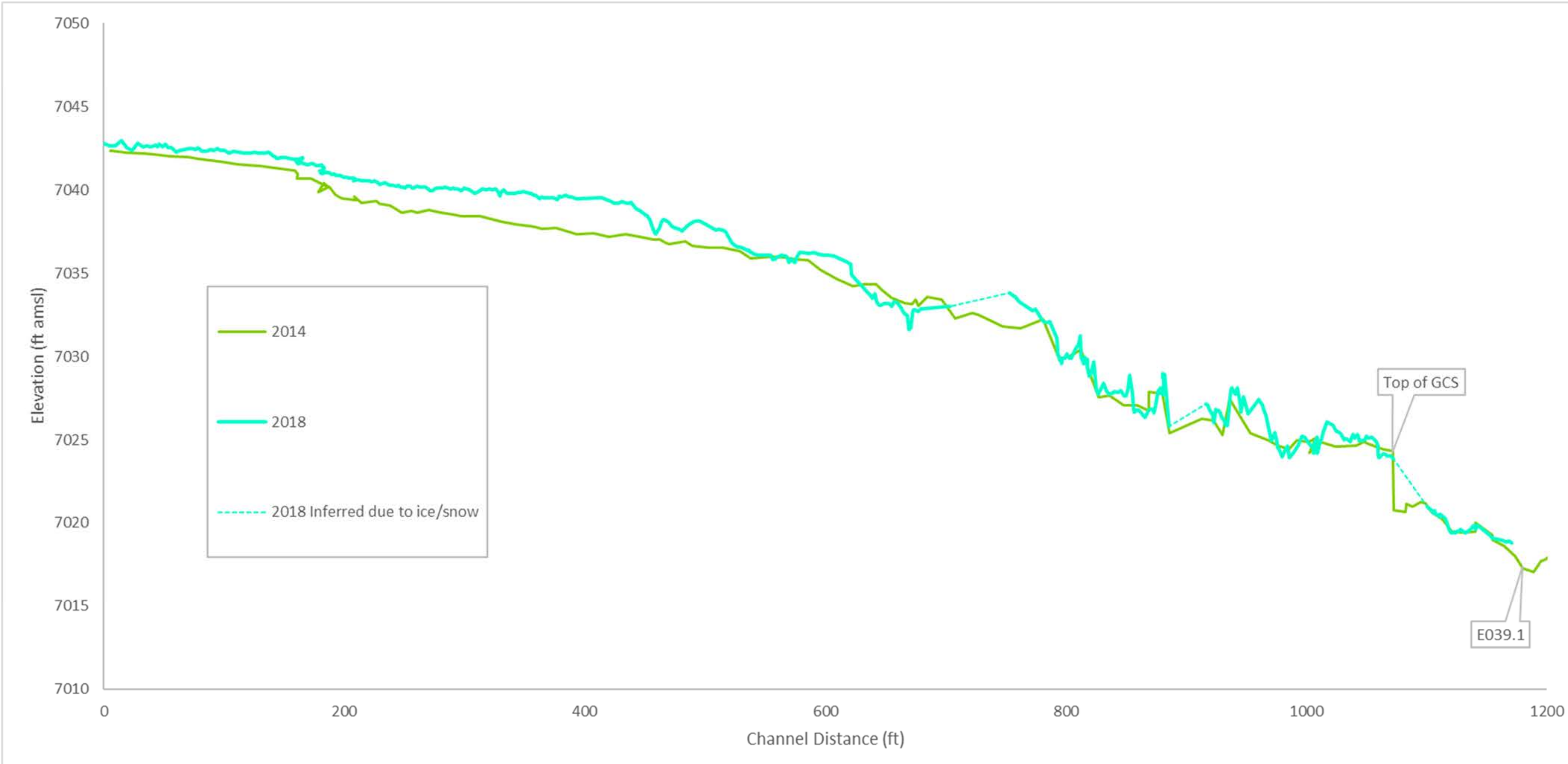
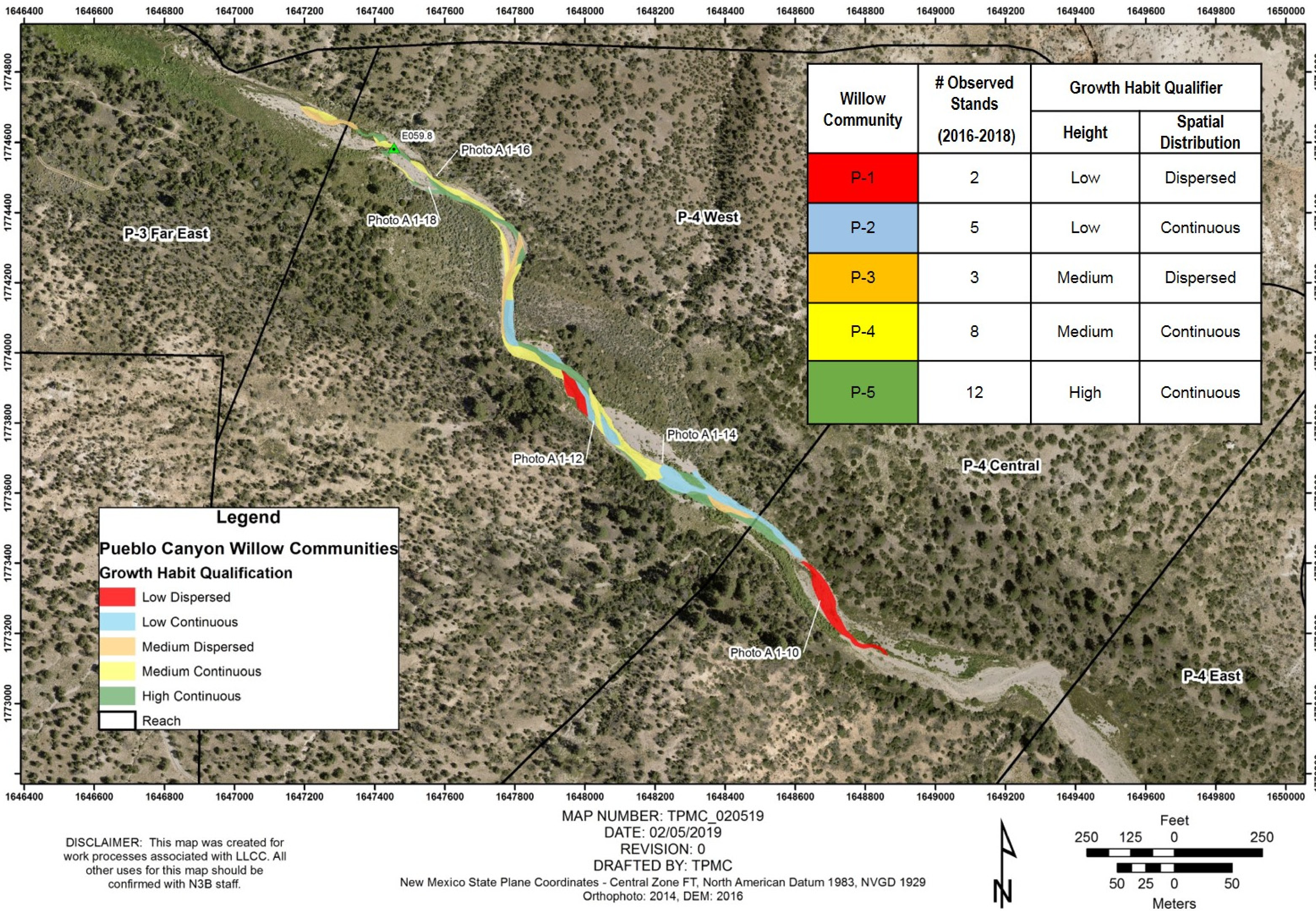


Figure A-4.8-4 Period of record thalweg profile in DP Canyon GCS area (14 times vertical exaggeration)



Willow Community	# Observed Stands (2016-2018)	Growth Habit Qualifier	
		Height	Spatial Distribution
P-1	2	Low	Dispersed
P-2	5	Low	Continuous
P-3	3	Medium	Dispersed
P-4	8	Medium	Continuous
P-5	12	High	Continuous

Figure A-6.1-1 Spatial distribution map of willow communities in Pueblo Canyon

Table A-6.1-1
September 2018 Pueblo Canyon Willow Community Monitoring Results

Willow Community	No. of Observed Communities	Height (ft)	Diameter (ft)	Growth Habit Qualifier	
				Height	Spatial Distribution
P-1	2	<5.0	<0.13	Short	Dispersed
P-2	5	<5.0	<0.13	Short	Continuous
P-3	3	5.0–7.0	0.13–0.21	Medium	Dispersed
P-4	8	5.0–7.0	0.13–0.21	Medium	Continuous
P-5	12	>7.0	>0.21	Tall	Continuous

Attachment A-1

Comparison Photographs
of Detected Change and Willow Monitoring in the
Los Alamos and Pueblo Canyon Watershed


(a)


(b)

Photo A1-1 Detected erosion (2016) in Pueblo Canyon in (a) November 2017 compared with the same view in (b) March 2019, showing no observable change


(a)

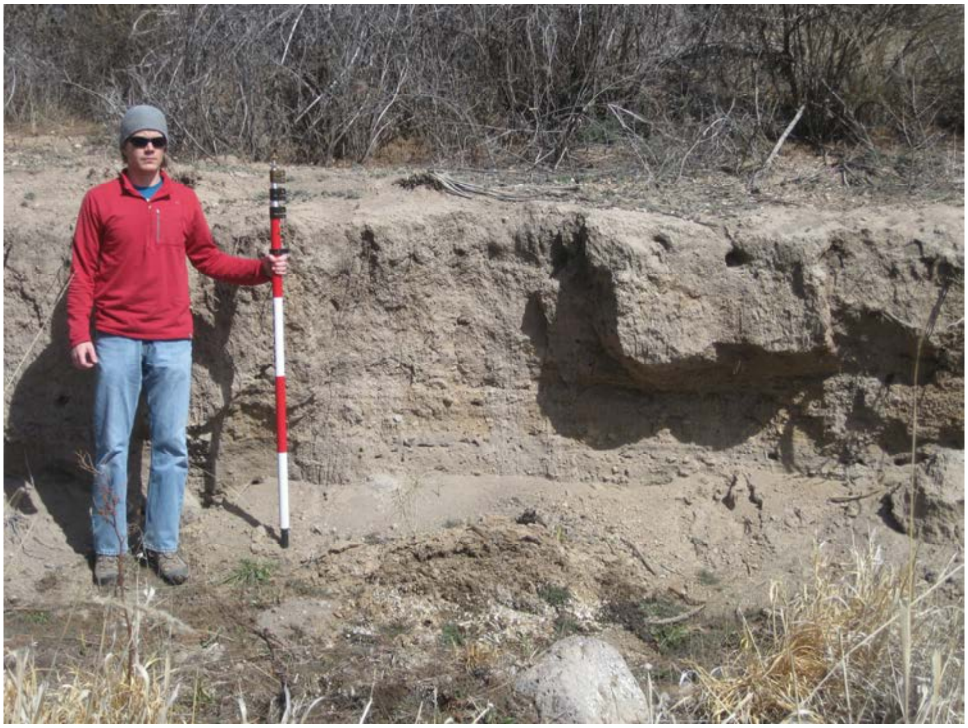

(b)

Photo A1-2 Detected erosion (2016) in Pueblo Canyon in (a) November 2017 compared with the same view in (b) March 2019, showing minor observable change

(a)

(b)

Photo A1-3 Detected erosion (2016) in Pueblo Canyon lower willow planting area in (a) March 2018 compared with the same view in (b) March 2019, showing minor observable change in side channel erosion



(a)

(b)

Photo A1-4 Detected bank collapse (2016) in Pueblo Canyon lower willow planting area in (a) March 2018 compared with the same view in (b) March 2019, showing minor observable change


(a)


(b)

Photo A1-5 Detected incision (2016) near the western edge of Reach P-4C in Pueblo Canyon GCS Area in (a) March 2018 compared with the same view in (b) March 2019, showing post-survey channel incision


(a)


(b)

Photo A1-6 Detected incision (2016) near the western edge of Reach P-4C in Pueblo Canyon GCS Area in (a) March 2018 compared with the same view in (b) March 2019, showing post-survey channel incision

(a)

(b)

Photo A1-7 Detected bank collapse (2016) above the DP Canyon GCS in (a) March 2018 compared with the same view in (b) March 2019, showing no observable change


(a)


(b)

Photo A1-8 Detected deposition (2016) in braided channel above the DP Canyon GCS in (a) March 2018 compared with the same view in (b) March 2019, showing minor observable change


(a)


(b)

Photo A1-9 Willows planted in tall-height, spatially continuous community (P-5) in 2014 in Pueblo Canyon lower willow-planting area, looking downstream from PU+400, in (a) September 2017 and in (b) November 2018

(a)

(b)

Photo A1-10 Willows planted in Tall-height, spatially-continuous community (P-5) in 2014 in Pueblo Canyon lower willow-planting area, looking downstream from PU+400, in (a) November 2016 and in (b) November 2018


(a)


(b)

Photo A1-11 Willows planted in medium-height, spatially continuous community (P-4) in 2014 in Pueblo Canyon lower willow-planting area, looking upstream from PU+300, in (a) September 2017 and in (b) November 2018

(a)

(b)

Photo A1-12 Willows planted in medium-height, spatially-continuous community (P-4) in 2014 in Pueblo Canyon lower willow-planting area, looking upstream from PU+300, in (a) November 2016 and in (b) November 2018


(a)


(b)

Photo A1-13 Willows planted in medium-height, spatially dispersed community (P-3) in 2014 in Pueblo Canyon lower willow-planting area, looking downstream from P4C+200, in (a) September 2017 and in (b) November 2018


(a)


(b)

Photo A1-14 Willows planted in medium-height, spatially-dispersed community (P-3) in 2014 in Pueblo Canyon lower willow-planting area, looking downstream from P4C+200, in (a) November 2016 and in (b) November 2018


(a)


(b)

Photo A1-15 Willows planted in short-height, spatially continuous community (P-2) example in 2014 in Pueblo Canyon lower willow-planting area, looking downstream from PU+1100, in (a) September 2017and (b) in November 2018


(a)


(b)

Photo A1-16 Willows planted in short-height, spatially-continuous community (P-2) in 2014 in Pueblo Canyon lower willow-planting area, looking downstream from PU+1100, in (a) November 2016 and in (b) November 2018


(a)


(b)

Photo A1-17 Willows planted in short-height, spatially dispersed community (P-1) in 2014 in Pueblo Canyon lower willow-planting area from northern stake at P4C+800, in (a) September 2017 and (b) example in November 2018

(a)

(b)

Photo A1-18 Willows planted in short-height, spatially-dispersed community (P-1) in 2014 in Pueblo Canyon lower willow-planting area, from northern stake at P4C+800, in (a) November 2016 and (b) in November 2018

Attachment A-2

Ground-Based Survey Data
(on CD included with this document)

Appendix B

2018 Watershed Mitigation Inspections

B-1.0 INTRODUCTION

Watershed storm water controls and grade-control structures (GCSs) are inspected on a routine basis and after significant flow events (greater than 50 cubic feet per second [cfs] at locations with gaging stations or greater than 0.5 in. in 30 min at locations without gaging stations). These inspections are completed to ensure the watershed mitigations are functioning properly and to identify if maintenance may be required. Examples of items evaluated during inspections include the following:

- Debris/sediment accumulation that could impede operation
- Water levels behind retention structures
- Physical damage of structure, or failure of structural components
- Undermining, piping, flanking, settling, movement, or breeching of structure
- Vegetation establishment and vegetation that may negatively impact structural components
- Rodent damage
- Vandalism
- Erosion

The photographs in this appendix depict annual or significant flow-event-driven storm water inspections of watershed mitigations in Los Alamos and Pueblo Canyons. Each group of photographs is associated with a specific feature (e.g., standpipe, weir, upstream, downstream, etc.) that has the potential to develop issues. The photographs are presented in chronological order and depict the feature in 2018. Photographs of features were taken to mirror previous inspection photographs as closely as possible.

In 2018, one GCS inspection occurred in May; the fall GCS inspection was not conducted in 2018. In October 2018, New Mexico Environment Department and Newport News Nuclear BWXT-Los Alamos, LLC, staff participated in a walkdown of the majority of GCSs in the Los Alamos and Pueblo Watersheds (because of construction at Technical Area 21, it was not feasible to visit the DP watershed control features). In 2019, both the spring (May) and post-monsoon (October) inspections are planned to be conducted.

In 2018, one storm event on September 4, 2018, triggered an inspection of the DP GCS when flow at E038 exceeded 50 cfs.

B-2.0 DP CANYON GRADE-CONTROL STRUCTURE

B-2.1 Embankment

Photo B-2.1-1 May 2018—Embankment is stable and operating as designed. Well-established vegetation with no erosion occurring from hillslope. Some trash and debris present.

Photo B-2.1-2 Flow event inspection for September 4, 2018, storm event—Embankment is stable and operating as designed. Well-established vegetation with no erosion occurring from hillslope.

Photo B-2.1-3 Flow event inspection for September 4, 2018, storm event—Embankment is stable and operating as designed. Well-established vegetation with no erosion occurring from hillslope.

Photo B-2.1-4 Flow event inspection for September 4, 2018, storm event—Continue to monitor minor rodent-caused erosion on north-east corner of embankment.

Photo B-2.1-5 May 2018—Erosion occurring at north-east corner of weir. No change since last inspection (October 2017), continue to monitor.

Photo B-2.1-6 Flow event inspection for September 4, 2018, storm event —Continue to monitor erosion occurring at north-east corner of weir. Not impacting structure. No change since last inspection (May 2018), continue to monitor.

B-2.2 Overflow Weir Structure

Photo B-2.2-1 May 2018—Upslope face of weir with some debris, looking east. Weir is functioning, no deteriorating joints or bulging gabion baskets. Continue to monitor crack on north end of weir. No change since last inspection.

Photo B-2.2-2 Flow event inspection for September 4, 2018, rain event—Continue to monitor minor crack on north end of weir. No change since last inspection (May 2018). Some debris present because of flow event.

Photo B-2.2-3 Flow event inspection for September 4, 2018, rain event—Some debris present.

B-2.3 Crest of Weir Structure

Photo B-2.3-1 May 2018—Weir structure looking upstream. No deteriorated joints present on upslope side of weir. Gabion basket is structurally intact and in stable condition. Continue to monitor for changes.

Photo B-2.3-2 Flow event inspection for September 4, 2018, storm event—Crest of weir structure. No deteriorated joints present on upslope side of weir. Gabion basket is structurally intact and in stable condition. Debris present. GCS outlet partially submerged with active flow.

Photo B-2.3-3 Flow event inspection for September 4, 2018, storm event—Weir structure looking upstream. No deteriorated joints present on upslope side of weir. Gabion basket is structurally intact and in stable condition.

B-2.4 Downstream Face of Overflow Weir Structure

Photo B-2.4-1 May 2018—Downstream face of weir. Continue to monitor bulging gabion baskets and rusting gabion basket. No evidence of cracking/spalling, area is clear of debris.

Photo B-2.4-2 **Flow event inspection for September 4, 2018, rain event—Downstream face of Weir. Continue to monitor bulging gabion basket and rusting gabion baskets. No change since last inspection (May 2018).**

Photo B-2.4-3 **Flow event Inspection for September 4, 2018, rain event—Downstream face of Weir. Water was actively flowing within channel. Water upstream of structure was seeping into standpipe. Water seeping through gabions. Wetness visible on concrete.**

B-2.5 GCS Standpipe

Photo B-2.5-1 May 2018—Standpipe. Standpipe has approximately 6 9n. of freeboard to top of standpipe level control board. Tire is present within standpipe. Standpipe is functional. Continue to monitor corrosion.

Photo B-2.5-2 Flow event inspection for September 4, 2018, rain event—Standpipe with approximately 6–8 in. of freeboard to top of standpipe level control board. Tire is present within standpipe. Standpipe is functional. Continue to monitor corrosion.

Photo B-2.5-3 Flow event inspection for September 4, 2018, rain event—Tire is present within standpipe. Standpipe is functional. Continue to monitor corrosion.

B-2.6 GCS Spillway

Photo B-2.6-1 May 2018—Spillway alignment. Spillway operating as designed. No sign of improper alignment, deterioration, or trash/debris on spillway.

Photo B-2.6-2 Flow event inspection for September 4, 2018, rain event. No signs of improper alignment, deterioration, or trash/debris on spillway.

B-2.7 GCS Outlet

Photo B-2.7-1 May 2018—Outlet corrosion. Outlet pond was dry at time of inspection. No evidence of undercutting, erosion, or excessive sediment deposition at time of inspection.

Photo B-2.7-2 Flow event inspection for September 4, 2018, rain event—Outlet submerged because of active flow. No erosion concerns noted. No significant amount of new sediment deposition with latest flow event. Outlet is also pictured on photos 2.3-2, 2.3-3, 2.4-3, and 2.6-2.

B-3.0 UPPER LOS ALAMOS CANYON SEDIMENT DETENTION PONDS

B-3.1 Lower Basin Embankment and Pond

Photo B-3.1-1 May 2018—Lower basin. No breaching/slides/cracks/sloughs present on embankment and pond. No erosion occurring on slope. Pond is dry. No trash or debris present in control. Continue to monitor rodent burrows.

B-3.2 Upper Basin Embankment and Pond

Photo B-3.2-1 May 2018—Upper basin. No breaching/slides/cracks/sloughs present on embankment and pond. No erosion occurring on slope. Pond is wet, no standing water. No trash or debris present in control. Continue to monitor rodent burrows.

B-3.3 Lower Basin Spillway

Photo B-3.3-1 May 2018—Lower basin spillway. No signs of erosion occurring on or near spillway. Spillway is maintaining alignment and stability. Continue to monitor rodent burrows.

B-3.4 Upper Basin Spillway

Photo B-3.4-1 May 2018—Upper basin spillway. No signs of erosion occurring on or near spillway. Spillway is maintaining alignment and stability. Continue to monitor rodent burrows.

B-3.5 Wetland and Culvert

Photo B-3.5-1 May 2018—Wetland vegetation. Willows and wetland vegetation well established, stable, and clear of trash/debris. No seepage or piping occurring.

Photo B-3.5-2 May 2018—Culvert inlet is two-thirds blocked, this is consistent with previous inspection (October 2017). Willows and wetland vegetation well established, stable, and clear of trash/debris. No seepage or piping occurring.

B-3.6 Upstream Pipeline and Appurtenances

Photo B-3.6-1 May 2018—Pipeline headwall displaying significant needle cast debris. Headwall functioning as designed. Needle cast is blocking portion of pipe inlet grate.

Photo B-3.6-2 May 2018—Pipeline cable support is skewed

B-3.7 Upstream Pipeline Vacuum Breaker

Photo B-3.7-1 May 2018—Pipeline vacuum breaker. Control is operating as designed with no apparent issues to structure.

B-3.8 Upstream Pipeline Bridge Structure

Photo B-3.8-1 May 2018—Pipeline bridge structure. Control is operating as designed with no apparent issues to structure.

B-3.9 Pipeline Outlet and Energy Dissipater

Photo B-3.9-1 May 2018—Pipeline outlet, energy dissipater, and gabion overflow structure. Pipeline outlet and energy dissipater is clear of debris with minor established vegetation occurring through turf-reinforcement mat (TRM). Culvert outlet and inlets appear functional.

B-4.0 LOS ALAMOS CANYON WEIR AND DETENTION PONDS

B-4.1 Weir Upstream Slope Embankment

Photo B-4.1-1 May 2018—Upstream northern embankment slope. Slope embankment is stable with established vegetation. Continue to monitor rodent burrows.

Photo B-4.1-2 May 2018—Upstream southern embankment slope. Slope embankment is stable with established vegetation. Continue to monitor rodent burrows.

B-4.2 Weir Embankment Abutment

Photo B-4.2-1 May 2018—Abutment looking south. Vegetation well established along weir embankment, continue to monitor sink-holes for change in size/condition. Wet from recent rain event.

B-4.3 Weir Embankment Downstream Slope

Photo B-4.3-1 May 2018—Downstream southern embankment slope. No erosion or sloughing of gabion baskets occurring. All gabion baskets appear to be structurally intact and operating as designed. Wet from recent rain event.

Photo B-4.3-2 May 2018—Downstream northern embankment slope. No erosion or sloughing of gabion baskets occurring. All gabion baskets appear to be structurally intact and operating as designed. Wet from recent rain event.

B-4.4 Upper Pond

Photo B-4.4-1 May 2018—Los Alamos Pond 1 (upper) looking downstream east. Pond has no capacity to retain sediment.

B-4.5 Middle Pond

Photo B-4.5-1 May 2018—Los Alamos Pond 2 (middle) looking downstream. The pond has no capacity to retain sediment.

B-4.6 Lower Pond

Photo B-4.6-1 May 2018—Los Alamos Pond 3 (lower) looking downstream. Approximately 8 ft of freeboard from bottom of pond to weir crest.

B-4.7 Upslope Face and Crest of Overflow Weir Structure

Photo B-4.7-1 May 2018—Upstream weir face. Continue to monitor bulging gabion baskets.

Photo B-4.7-2 May 2018—Weir crest. Continue to monitor broken gabion wires on weir crest for need of preventative maintenance.

Photo B-4.7-3 **May 2018—Broken gabion wires on north end of weir crest. Continue to monitor broken gabion wires on weir crest for need of preventative maintenance.**

Photo B-4.7-4 **May 2018—Broken gabions on south end of crest. Continue to monitor broken gabion wires on weir crest for need of preventative maintenance.**

B-4.8 Downstream Face of Overflow Weir Structure

Photo B-4.8-1 May 2018—Downstream weir face. Continue to monitor bulging baskets and joints.

B-4.9 Weir Standpipe

Photo B-4.9-1 May 2018—Standpipe. Gage reads approximately 5.5 ft of sediment and debris. Approximately 3 ft of standpipe exposed no change from previous inspection. Inlet is clear of debris and functioning correctly.

B-4.10 Weir Outlet

Photo B-4.10-1 May 2018—Weir outlet. Outlet is stable with no evidence of piping or undercutting. Outlet is functional and not impeded by sediment, trash, or debris. Continue to monitor channelization occurring from outlet to channel.

B-4.11 Borrow Pit Runoff Control Berm

Photo B-4.11-1 May 2018—Borrow pit and berm. Construction debris are present from Los Alamos County construction project. Continue to monitor and determine timing for repair to torn TRM on berm after cessation of Los Alamos County construction project. Continue to monitor rodent burrows.

B-5.0 PUEBLO CANYON GRADE-CONTROL STRUCTURE

B-5.1 Upstream Embankment

Photo B-5.1-1 May 2018—South embankment, looking west. Well-established vegetation on embankment. No signs of erosion or undermining.

B-5.2 Embankment Abutment

Photo B-5.2-1 May 2018—Embankment abutment from north side of channel, looking south. Well-established vegetation surrounding control. No presence of trash/debris.

B-5.3 Downstream Embankment and Outlet

Photo B-5.3-1 May 2018— Downstream south embankment and scour-stop, looking south. Control is operating as designed. No buckling of embankment occurring. Riprap functioning as designed. Vegetation established and no evidence of erosion. Some scour-stop is buckling but is still anchored; continue to monitor.

Photo B-5.3-2 May 2018—Downstream north embankment and scour-stop, looking north. Control is operating as designed. No buckling of embankment occurring. Riprap functioning as designed. Vegetation established and no evidence of erosion. Approximately 4 in. of culvert is revealed. Some scour-stop is buckling but is still anchored; continue to monitor.

B-5.4 Crest of Overflow Weir Structure and Spillway

Photo B-5.4-1 May 2018—Weir crest and flow-way, looking south. Sediment has filled in to top of spillway upstream of the structure. No cracks present in concrete. Structure is in alignment and functioning as designed. Continue to monitor bulging basket at north end of weir.

Photo B-5.4-2 May 2018—Weir crest and flow-way, looking north. Sediment has filled in to top of spillway upstream of the structure. No cracks present in concrete. Structure is in alignment and functioning as designed. Continue to monitor deteriorating joint on north flow-way edge and bulging gabion basket at north end of weir.

Photo B-5.4-3 **May 2018—Weir spillway and flow-way, looking south. Sediment has filled in to top of spillway upstream of the structure. No cracks present in concrete. Structure is in alignment and functioning as designed. Continue to monitor deteriorating joint on north flow-way edge and bulging gabion basket at north end of weir.**

B-5.5 Downstream Face of Overflow Weir Structure Showing Outlet and Spurs

Photo B-5.5-1 **May 2018—Redi-rock spurs, looking east. Well-established vegetation along all hillslopes. No erosion apparent along slopes or near TRM. All structures functioning as designed.**

B-6.0 PUEBLO CANYON WETLAND STABILIZATION STRUCTURE

B-6.1 Upper, Middle, and Lower Pueblo Wetland Structure

Photo B-6.1-1 May 2018—Redi-rock block structure, looking north. Redi-rock structure shows no evidence of displacement or settling, no noted erosion. Continue to monitor grass transplanted in 2017.

Photo B-6.1-2 May 2018—Redi-rock block structure, looking southeast. Redi-rock structure shows no evidence of displacement or settling, no noted erosion. Continue to monitor grass transplanted in 2017.

B-6.2 Wetland North Bank

Photo B-6.2-1 May 2018—Wetland north bank, looking northeast. Slope is stable with no evidence of erosion where riprap is located. Structure is functioning as designed with established vegetation.

B-6.3 Wetland South Bank

Photo B-6.3-1 May 2018—South bank, looking southeast. Slope is stable no evidence of erosion where riprap is located. Structure is functioning as designed with established vegetation.

B-6.4 Downstream South Bank

Photo B-6.4-1 May 2018—Redi-rock structure and berm, looking south. Berm is stable no noted erosion or breaching/slides/cracks to berm.

B-6.5 Upstream Area of Wetland

Photo B-6.5-1 May 2018—Upstream pond, looking upstream. TRM at pond is not visible. The pond is approximately 3–4 ft deep. Branches have been placed in pond.

Appendix C

Analytical Results and Instantaneous
(5-min) Gaging Station Stage and Discharge Data
for the Los Alamos/Pueblo Watershed
(on CD included with this document)